United States Court of Appeals
for the
District of Columbia Circuit

TRANSCRIPT OF RECORD

No. 11,096

JOINT APPENDIX

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

United States Court of Appeals
For the
District of Columbia Circuit

FILED SEP 27 1951

Joseph W. Stewart

559

AMERICAN CYANAMID COMPANY,
Plaintiff-Appellant,

v.

JOHN A. MARZALL, Commissioner of Patents,
Defendant-Appellee.

Appeal from the Judgment of the District Court for the District of Columbia

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United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

No. 11,096

AMERICAN CYANAMID COMPANY, *Appellant*,

v.

JOHN A. MARZALL, Commissioner of Patents, *Appellee*.

Appeal from the United States District Court for the District of Columbia

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JOINT APPENDIX

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191 Filed May 6 1948 Harry M. Hull, Clerk

IN THE DISTRICT COURT OF THE UNITED STATES
FOR THE DISTRICT OF COLUMBIA

AMERICAN CYANAMID COMPANY, 30 Rockefeller
Plaza, New York, New York, Plaintiff

v.

LAWRENCE C. KINGSLAND, Commissioner of Patents,
Washington 25, D. C., Defendant

Civil Action No. 1887-'48

Complaint To Obtain Letters Patent

The Plaintiff herein for its complaint alleges:

1. Plaintiff, American Cyanamid Company, is a corporation organized and existing under the laws of the State of Maine, and having its principal office at New York, New York.

2. Defendant, Lawrence C. Kingsland, is a citizen of the United States, is the Commissioner of Patents, and as such is a legal resident of the District of Columbia and is sued herein in his official and representative capacity.

3. This suit arises under the patent laws of the United States and the jurisdiction of this case is predicated upon Section 4915 of the Revised Statutes, U.S.C., Title 35, paragraph 63, as amended.

4. Plaintiff is informed and believes that Robert Ben Booth and Norman Morash, citizens of the United States and residents of Springdale, County of Fairfield, State of Connecticut, and Stamford, County of Fairfield, State of Connecticut, respectively, are the first, joint and original inventors of an invention entitled Method For Clarifying

Lubricating And Cooling Emulsions, for which they
192 made joint application for Letters Patent Serial No.
443,816 to the Commissioner of Patents on May
20, 1942, which application was complete and in all respects
complying with the requirements of law in such cases made
and provided.

5. Plaintiff is the present owner of the entire right, title and interest in and to said invention and said application for Letters Patent Serial No. 443,816 by virtue of an assignment executed by Robert Ben Booth and Norman Morash on May 26, 1942, and filed for recordation in the Patent Office assignment records on May 5, 1948.

6. Said application for Letters Patent has been duly prosecuted in accordance with the patent laws of the United States and rules of the United States Patent Office, and Plaintiff is entitled to Letters Patent on the invention therein described and claimed.

7. Plaintiff seeks to secure claims 33 through 43, inclusive, of said application for Letters Patent, which claims are as follows:

33. The process of clarifying a used, oil-in-water, emulsion-type, lubricating coolant contaminated by solid particles without appreciably altering the physical properties of the original coolant which comprises the steps of simultaneously subjecting a volume of said used coolant to aeration and intense agitation in the absence of added reagents, whereby a froth layer is formed at the surface of said coolant volume and substantially all said contaminants are concentrated in said froth layer as it forms; removing the contaminant-bearing froth from said froth layer and recovering the so clarified coolant.

34. The process of clarifying a used, oil-in-water, emulsion-type, lubricating coolant contaminated by solid particles without appreciably altering the physical properties

of the original coolant which comprises the steps of simultaneously subjecting a volume of said used coolant to aeration and intense mechanical agitation in the absence of added reagents, whereby a froth layer is formed at the surface of said coolant volume and substantially all said contaminants are concentrated in said froth layer as it forms; removing the contaminant-bearing froth from said froth layer and recovering the so clarified coolant.

193 35. A process according to claim 44 adapted for use when a part of the solid contaminants are magnetically susceptible in which the contaminated coolant is subjected to field of magnetic force of sufficient intensity to remove substantially all the magnetically-susceptible contaminants before being subjected to the agitating and aerating operation.

36. The process of continuously removing substantially all the solid particles from a used, oil-in-water emulsion-type lubricating coolant contaminated thereby, without appreciably altering the physical properties of the original coolant, which comprises the steps of subjecting a substantially fixed volume of contaminated coolant simultaneously to aeration and intense agitation in the absence of added reagents, whereby a froth layer is formed at the surface of said coolant volume and substantially all said contaminants are concentrated in said froth layer as it forms; continuously skimming contaminant-bearing froth from said froth layer at substantially the rate at which the froth is formed; continuously withdrawing decanting clarified coolant from said coolant volume at a level below the froth layer and continuously adding contaminated coolant to said coolant volume, at substantially the same rate that clarified coolant is decanted therefrom, but at a point other than that at which the clarified coolant is withdrawn.

37. A process according to Claim 34 in which the collected froth is allowed to stand for sufficient time to allow the froth to collapse, whereby separate layers of highly contaminated and relatively clean coolant are obtained, fluid is decanted from the relatively clean layer, the fluid decanted from said relatively clean layer is returned to the aerating and agitating step and the separated contaminants collected.

38. The process of continuously removing substantially all the solid particles from a used, oil-in-water, emulsion-type, lubricating coolant contaminated thereby, without appreciably altering the physical properties of the original coolant, which comprises the steps of subjecting a substantially fixed volume of contaminated coolant simultaneously to aeration and intense mechanical agitation in the absence of added reagents, whereby a froth layer is formed at the surface of said coolant volume and substantially all said contaminants are concentrated in said froth layer as it forms; continuously skimming contaminant-bearing froth from said froth layer at substantially the rate at which the froth is formed; continuously withdrawing clarified coolant from said coolant volume at a level below the froth layer and continuously adding contaminated coolant to said coolant volume, at substantially the same rate that clarified coolant is decanted therefrom, but at a point other than that at which the clarified coolant is withdrawn.

39. The process of continuously clarifying a used, water-in-oil, emulsion-type, lubricating coolant contaminated by solid particles which vary widely in size and degree of agglomeration, without appreciably altering the physical properties of the original coolant, which comprises the steps of subjecting the contaminated coolant to settling for only a sufficient time to remove those larger and agglomerated contaminants of sufficient mass to be unamenable to froth flotation, collecting the settled contaminants, subject-

ing the coolant and the residual contaminants therein simultaneously to aeration and intense agitation in the absence of reagents whereby a forth layer is formed at surface of said coolant and substantially all the residual contaminants are concentrated in said froth layer as it forms, removing the contaminant-bearing froth and removing the so clarified coolant.

194 40. The process of continuously clarifying a used, oil-in-water, emulsion-type lubricating coolant contaminated by solid particles, which particles vary widely in size and degree of agglomeration, without appreciably altering the physical properties of the original coolant, which comprises the steps of continuously passing the contaminated coolant through a relatively quiescent zone in which the period of dwell is only sufficient to permit those larger and agglomerated contaminants of sufficient mass to be unamenable to froth flotation to settle; collecting the settled contaminants; passing the partially-clarified coolant and the residual contaminants into a substantially fixed volume of coolant, simultaneously subjecting said fixed volume to aeration and intense agitation in the absence of added reagents, whereby a froth layer is formed at the surface thereof; continuously removing contaminant-bearing froth from said froth layer at substantially the rate at which froth is being formed; and continuously recovering clarified coolant from said fixed volume at substantially the same rate that partially-clarified coolant is added thereto from a level below said froth layer.

41. The process of clarifying used, oil-in-water, emulsion-type, lubricating coolant contaminated by metallic and other solid particles, without appreciably altering the physical characteristics of the original coolant, which comprises the steps of establishing a volume of used coolant having a free surface; simultaneously subjecting said volume of used coolant to aeration and agitation sufficient to form

at said free surface a froth layer containing substantially all of said contaminants concentrated in said froth layer, collecting the contaminant-bearing froth from the so-treated coolant and recovering the so-clarified coolant.

42. The process of clarifying used, oil-in-water, emulsion-type, lubricating coolants contaminated by metallic and other solid particles dispersed therein, without appreciably altering the physical properties of the original coolant, which comprises establishing a volume of used coolant having a free surface; simultaneously subjecting said volume of used coolant to sufficient aeration and intense physical agitation, whereby a forth layer is formed at said free surface and substantially all said contaminants are concentrated in said froth layer; removing the contaminant-bearing froth from the so-treated coolant and recovering the so-clarified coolant.

43. The process of continuously removing substantially all of the solid particles from a used, oil-in-water, emulsion-type, lubricating coolant, contaminated by metallic and other solid particles dispersed therein, without appreciably altering the physical properties of the original coolant, which comprises the steps of establishing a substantially fixed volume of contaminated coolant having a free surface, subjecting such volume of contaminated coolant simultaneously to aeration and intense physical agitation sufficient to form at said free surface a froth layer, whereby substantially all of said contaminants are concentrated in said froth layer as it forms; continuously skimming contaminant-bearing froth from froth layer at substantially the rate at which the froth is formed; continuously withdrawing clarified coolant from the so-treated coolant volume at a level below the froth layer and continuously adding contaminated coolant to said coolant volume at substantially the same rate that clarified coolant is withdrawn

therefrom, but at a point other than that at which the clarified coolant is withdrawn.

195 8. Said application for Letters Patent was examined by the Primary Examiner, who allowed Claims 34, 37 and 38 and refused to allow and finally rejected claims 33, 35, 36 and 39 through 43 inclusive. Said rejection was grounded upon Karlstrom patents 2,248,177 and 1,717,223 and Sulman et al patent 835,120 as to claims 33, 36, 41, 42 and 43, further grounded on indefiniteness and functionality of language as to claims 41, 42 and 43, grounded on limitation to a non-elected species of the invention barred from claiming in the absence of an allowable generic claim as to claim 35 and grounded on Brown patent 1,455,187, Munro patent 1,937,837, and Booth patent 2,153,448 as to claims 39 and 40.

9. Appeal was taken seasonably from the decision of the Primary Examiner to the Board of Appeals of the United States Patent Office, and on February 5, 1948 a decision was rendered by the Board of Appeals affirming the Examiner's rejection of claims 33, 35, 36 and 39 through 43 inclusive, and, moreover, rejecting claims 34, 37 and 38 which had been allowed by the Primary Examiner and which were not involved in the appeal. But, except as to the rejection of claim 35 as drawn to a non-elected species, the grounds of rejection in said decision of the Board of Appeals were different from the grounds of rejection relied upon by the Primary Examiner. The grounds of rejection relied upon by the Board of Appeals were the aforesaid Brown patent in view of the state of the art as collectively shown by the aforesaid Karlstrom, Booth, Sulman and Munro patents as to claims 33, 36, 39 through 43, and also the aforesaid Karlstrom or Booth (sic) patents in view of the Sulman, Munro or Booth (sic) patents as to claims 33, 36, 41, 42 and 43. Such

same two grounds of rejection also were relied upon as to previously allowed claims 34, 37 and 38.

196 10. Following request for reconsideration confined to previously allowed claims 34, 37 and 38, and claim 40, the Board of Appeals rendered a second decision on reconsideration dated March 22, 1948 asserting its jurisdiction over said previously allowed claims. A decision of the Commissioner of Patents on petition, dated March 25, 1948, approved the jurisdiction of the Board of Appeals to reject said previously allowed claims, following which the Board of Appeals rendered a third decision, dated April 14, 1948, adhering to its first decision as to rejection of previously allowed claims 34, 37 and 38, and claim 40, and also affirming upon the same grounds their previous rejection of claims 33, 35, 36, 39, 41, 42 and 43.

11. Plaintiff avers that the decision of the Primary Examiner and the aforesaid three decisions of the Board of Appeals, likewise the aforesaid decision of the Commissioner of Patents, are in error, both in law and in fact, that claims 34, 37 and 38 which had been allowed by the Examiner were improperly rejected by the Board for lack of jurisdiction under the patent laws of the United States and the rules of the Patent Office, that said claims are patentable, that claims 33, 35, 36 and 39 through 43 inclusive also are patentable, and that Plaintiff is entitled to allowance of each and all of said claims and to the issue of Letters Patent thereon.

12. No appeal has been taken to the U. S. Court of Claims and Patent Appeals from the decisions of the Board of Appeals and the present action is filed within six months after all of said decisions of the Board of Appeals.

197 WHEREFORE, Plaintiff prays that this Court take cognizance of this complaint and adjudged that

Plaintiff is entitled, according to law, to receive Letters Patent for the said invention as specified in the aforesaid claims or any part thereof, as the facts in the case may appear, and that such adjudication authorize the Commissioner of Patents to issue Letters Patent to Plaintiff thereon in accordance with the practice in such cases.

AMERICAN CYANAMID
COMPANY
By Parry & Miller
Parry & Miller
1179 National Press Building
Washington 4, D. C.
Attorneys for Plaintiff

* * * *

199 Filed Jun 25 1948 Harry M. Hull, Clerk

Answer to the Complaint

To the Honorable the Justices of the District Court of the United States for the District of Columbia.

1, 2, 3. Defendant admits the allegations of paragraphs 1, 2 and 3.

4. He admits that on May 20, 1942, Robert Ben Booth and Norman Morash, claiming to be the first, joint and original inventors of alleged improvements in "Method for Clarifying Lubricating and Cooling Emulsions", filed in the Patent Office an application for patent thereon, to which application Serial No. 443,816 was given. He admits that the said application was complete and in compliance with the formal requirements of law. He denies, for reasons hereinafter given, that plaintiff is lawfully entitled to receive a patent on said application.

5. He admits the allegation of assignment of said ap-

plication to plaintiff by the applicants Robert Ben Booth and Norman Morash.

200 6. He admits the allegations of paragraph 6.

7. He admits that claims 33 to 43 of said application are as set out in paragraph 7, with the following exceptions:

In Claim 35, line 1, the number "44" should be *42*.

In Claim 36, line 12, the word "decanting" should not appear.

In Claim 39, line 15, the word "removing" should be *recovering*.

8. He admits the allegations of paragraph 8, except the allegation as to the number of the Booth patent. He states that the proper number is *2,153,449*.

9, 10. He admits the allegations of paragraphs 9 and 10.

11. He denies the allegations of paragraph 11. He states that plaintiff is not lawfully entitled to receive a patent on said application for the reason that said claims are unpatentable in view of the following prior patents and for the reasons given by the Board of Appeals in its decisions dated February 5, 1948, March 22, 1948, and April 14, 1948, copies of which will be furnished at the trial:

Sulman et al., 835,120, Nov. 6, 1906,
Brown, 1,455,187, May 15, 1923,
Karlstrom, 1,717,223, June 11, 1929,
Munro, 1,937,837, Dec. 5, 1933,
Booth, 2,153,449, April 4, 1939,
Karlstrom, 2,248,177, July 8, 1941,
Callow, 1,366,767, Jan. 25, 1921,
Breerwood, 2,214,717, Sept. 10, 1940.

Profert of copies of these patents is hereby made. Further answering Defendant states that claims 39 and 40 are for the same alleged invention as that covered by claim 7 of plaintiff's prior patent, Booth et al., No. 2,436,375, and that consequently plaintiff is not lawfully entitled to receive a patent containing said claims 39 and 40.

201 12. He admits the allegations of paragraph 12.

W. W. Cochran,
Solicitor, U. S. Patent Office,
Attorney for Defendant.

* * * *

202 Filed Dec 14 1949 Harry M. Hull, Clerk

Order

Upon consideration of the fact that John A. Marzall succeeded to the office of Commissioner of Patents on December 2, 1949, in place of Lawrence C. Kingsland, who resigned, and it appearing that there is substantial need for continuing and maintaining the above-entitled action, now therefore it is this 13th day of December 1949

ORDERED that John A. Marzall, Commissioner of Patents be and he is hereby substituted as party defendant in place of Lawrence C. Kingsland, formerly Commissioner of Patents.

H. A. Schweinhaut,
Judge.

* * * *

203 Filed Dec 14 1950 Harry M. Hull, Clerk

Memorandum Opinion

I find no invention.

The Supreme Court on December 4, 1950 No. 32, in the case of *The Great Atlantic and Pacific Tea Company* v. *Supermarket Equipment Corporation, et al.*, made this observation:

"The function of a patent is to add to the sum of useful knowledge. Patents cannot be sustained when, on the contrary, their effect is to subtract from former resources freely available to skilled artisans."
and then again:

"The conjunction or concert of known elements must contribute something; only when the whole in some way exceeds the sum of its parts is the accumulation of old devices patentable. Elements may, of course, especially in chemistry or electronics, take on some new quality or function from being brought into concert, but this is not a usual result of uniting elements old in mechanics."
I think this language appropriate here.

In my view the plaintiff in this case is merely a routineer.

Counsel will prepare tentative findings of fact and proper order.

/s/ Matthew F. McGuire,
McGuire, J.

• • • •

204 Filed Mar 8 1951 Harry M. Hull, Clerk

Findings of Fact

1. This civil action is one of two proceedings brought by plaintiff, American Cyanamid Company, under Section 4915 R. S. (35 U.S.C. 63) and heard together. The other

is Civil Action No. 96-49, which is likewise entitled American Cyanamid Company v. John A. Marzall, Commissioner of Patents.

2. In the present civil action, plaintiff sought to have the Court find that it, as the assignee of an application entitled "Method For Clarifying Lubricating and Cooling Emulsions," Serial No. 443,816, filed by Robert Ben Booth and Norman Morash in the United States Patent Office on May 20, 1942, is entitled to have a patent issued to it containing claims 33 to 43, inclusive, of that application.

3. In their application, Serial No. 443,816, Booth and Morash point out that the clarification of lubricating coolants has been the subject of prior investigations by others. The applicants and those others have been concerned with the light oil solutions of soaps, which, as cut with water to form emulsions of varying composition, have been used to abstract heat and to lubricate tools employed in metal working operations, including grinding. In such operations, these oil-in-water emulsion-type lubricating coolants pick up, as contaminants, metal particles and cuttings, abrasive grit and dirt.

205 4. To remove such contaminants from the lubricating coolants, applicants' predecessors have resorted to such separating procedures as: (1) settling, and (2) filtration. Also available to the workers in the art have been such other known separation processes as: (3) tabling, (4) centrifuging, and (5) magnetic separation.

5. To remove the same contaminants, applicants resort to froth flotation. They assert in their application that they have used a "Fagergren" flotation machine with satisfactory results, but add that other known types of flotation cells, whether of a mechanical type, a pneumatic type or an apparatus employing a combination of both, may be used effectively. In their specification, as filed, applicants also expressly stated that the contaminated

lubricating and cooling emulsions could be subjected to froth flotation with or without the use of additional flotation reagents. As indicated by the applicants, the reason why additional reagents may, in some instances, be dispensed with is that the emulsions are made from oil containing various soaps, and hence the used emulsion when subjected to the action of a flotation machine froths readily. When the addition of a frothing agent is necessary, applicants add such common frothers as pine oil and the like.

6. In their application, applicants specify that the flotation process may be used in combination with the other known separation processes of settling, filtering, tabling, centrifuging, and magnetic separation.

7. Claim 35 in suit is drawn to a non-elected species. Under the provisions of Rule 141 of the Rules of Practice of the United States Patent Office in Patent Cases, claim 35 hence is not allowable in the application in suit, and likewise needs no consideration, unless it be first found that such a generic claim as claim 42 is patentable.

206 8. Claims 33 and 40 were selected by plaintiff at the trial as typical of all the claims in suit.

9. The patent to Brown, No. 1,455,187, discloses a grinding fluid circulating system. In dealing with such grinding fluids as those formed as an emulsion of water and oil, and in directing his efforts toward separating from the grinding fluid substantially all of the solid particles which might affect the grinding action detrimentally, Brown discovered that centrifugal action may be employed to separate the grit and other solid particles from the grinding compound and produce a substantially clear fluid. Brown combined with the centrifuge in his fluid circulating system a settling tank that serves to remove the coarser particles and permit the centrifugal device to act only upon the fine suspended matter.

10. On April 4, 1939, and hence more than the statutory year prior to the filing by Booth and Morash of their application in suit, Serial No. 443,816, Booth, himself, had received patent No. 2,153,449, relating to the clarification of rayon spin baths. In that patent, Booth noted that such a bath becomes befouled with decomposition products including sulfur and requires clarification before the bath can be reused. For clarification, Booth resorted to froth flotation with or without the addition of flotation agents, carrying such flotation process on in different types of flotation machines, including the "Fagergren" machine. As an allegedly "unique" characteristic of his patented process, and in purported contrast to ordinary flotation processes, Booth related that the same flotation procedure removes a concentrate which contains sulfur to the extent of 70-80% with the remaining material which is chemically totally unrelated to sulfur. The claims of Booth's patent, No. 2,153,449, recite that the froth removed in the defined method contains the bulk of the turbid impurities present in the befouled rayon spin bath. Turbid
207 impurities would include all stirred up sediment, inclusive of or additional to sulfur, that might have caused the rayon spin bath to become clouded, muddy, or polluted.

11. In showing the extension of flotation in its broad aspect, beyond the field of ore dressing, the Karlstrom patents, Nos. 1,717,223 and 2,248,177, teach that if air or another gas is introduced into a tank containing the so-called "white" or waste water coming from paper mills, the paper-pulp fibers will be lifted to the surface by adhering bubbles and can thereby be recovered. Karlstrom does not teach the use of froth flotation, nor does he disclose the floating of mixed solids.

12. In his patent, No. 2,214,717, Breerwood teaches that froth flotation may be employed as a step in the beneficiation of cement raw materials. The action involves selec-

tive separation of mixed solids in water, with flotation of one solid and settlement of another solid.

13. The Sulman et al patent, No. 835,120, teaches that metalliferous matter, graphite and the like, may be separated from gangue by means of oils and fatty acids, including, specifically, oleic acid. The patented process broadly comprises mixing the powdered ore with water, adding a small proportion of the oily liquid amounting to a fraction of one percent of the ore, agitating the mixture until the oil-coated mineral matter forms into a froth, and separating the froth from the remainder by flotation. The patentees state that the froth derives its power of flotation mainly from the inclusion of air-bubbles introduced into the mass by the agitation. The action involves the selective separation of mixed solids. The ore is floated and the solid gangue settles.

14. The patent to Munro, No. 1,937,837, provides for the concentration of ores by a combined classifying and flotation operation. Classifying means of the 208 reciprocating rake type collect and discharge the larger particles of ground ore that settle from the liquid in which they are suspended. Finer particles are removed by flotation. The flotation means exemplarily is of the aeration type. In his patent, Munro expressly asserts that oils, cresols or other substances having the required flotative properties are added to the pulp before or after it enters the flotation part of the apparatus. It is within the teachings of the Munro patent to introduce the suspension of ore in the classifier section, so as to allow the coarser particles to settle before the finer particles are removed by froth flotation. The action involves the selective separation of mixed solids. The ore is floated and the solid gangue settles.

15. The patent to Callow, No. 1,366,767, teaches that oils may be mixed with finely ground ore pulp and the

mixture then subjected to a violent agitation, with the result that large volumes of air are beaten into and entrained by the pulp for the purpose of producing a froth composed of bubbles of air and oil to which the mineral particles attach. Such agitation is induced by fine streams or jets of air, gas or vapor. The action involves the selective separation of mixed solids. The ore is floated and the solid gangue settles.

16. In view of the teachings of the several foregoing patents, and particularly of the joint teachings of the two patents to Brown and Booth, Nos. 1,455,187 and 2,153,449, it did not require invention to devise the process defined by claims 33, 34, 36, 37, 38, 39, 40, 41, 42, and 43 in suit.

17. Froth flotation, as applied to the clarification of contaminated lubricating coolants, involves no unusual phenomena, and gives generally foreseeable results.

18. To substitute a froth flotation cell for the centrifuge of the clarification system disclosed in the Brown patent, No. 1,455,187, would not involve the exercise of invention.

209 19. The process disclosed in the Brown patent, No. 1,455,187, operates "continuously" within the meaning of that quoted term as used in claims 36, 38, 39, 40 and 43 in suit. A system including a settling tank and a flotation cell may be continued in operation, without attention, for a longer period than a similar system comprising a filter or a centrifuge, because the flotation cell is self-cleaning. Longer continued operation, however, is a concomitant of the use of the flotation cell.

20. Claims 33, 34, 36, 37, 38, 39, 40, 41, 42, and 43 in suit are unpatentable in view of all the patents hereinabove discussed, and particularly in view of the patents to Brown and Booth, Nos. 1,455,187 and 2,153,449.

21. Claims 33, 34, 36, 37, 38, 39, 40, 41, 42, and 43 are unpatentable in view of the Booth patent, No. 2,153,449, alone. This patent indicates that froth flotation is an old technique for separating materials. As a witness for plaintiff, applicant Booth conceded that in resorting to that technique, he and Morash "expected something to float" after they "had run the settling test and had observed that a certain portion did float." The fact that the results allegedly obtained by them might have exceeded their expectations would not serve to turn what was a non-inventive concept into an inventive one.

22. Claim 7 of the Booth and Morash patent, No. 2,436,375, and claims 39 and 40 of the co-pending Booth and Morash application, Serial No. 443,816, in suit, define the same substantial subject matter, and, in consequence, claims 39 and 40 are unpatentable on the ground of double patenting.

23. Because such a generic claims as claim 42 is not patentable, claim 35 is not allowable in the application in suit, and it has not been considered on its merits.

24. Installations for carrying on the process defined by claims 33, 34, 36, 37, 38, 39, 40, 41, 42, and 43 in suit have gone into extensive commercial use.

Conclusions of Law

1. Commercial success may serve as a makeweight in determining patentability, but it is only thrown into the scales when the question of invention is otherwise in doubt.

2. It does not amount to invention to discover that an old process is better in its results, when applied to a new working, than would have been expected; and the public cannot be deprived of an old process because some one has discovered that it is capable of producing a better result, or has a wider range of use than was before known.

3. It is not a patentable invention to apply old and well-known processes to new uses, in other and analogous arts.

4. A claim of an application must be refused on the ground of double patenting when it is in substance the same as the claim of a patent issued to the same party.

5. Plaintiff, American Cyanamid Company, is not entitled to a patent containnig any of claims 33 to 43, inclusive, of the Booth and Morash application, Serial No. 443,816, in suit.

6. The complaint should be dismissed as to all the claims in suit.

Matthew F. McGuire,
March 8, 1951. Judge.

• • • •

211 Filed Mar 8 1951 Harry M. Hull, Clerk

Judgment

This action came on to be heard at the January term, 1950, and thereupon upon consideration thereof, it is this 8th day of March, 1951

ADJUDGED that the complaint be and it is hereby dismissed, with costs against plaintiff.

Matthew F. McGuire,
Judge.

• • • •

212 Filed May 24 1951 Harry M. Hull, Clerk

Motion for Extension of Time for Appeal

Comes plaintiff, by his attorney, and moves under the provisions of 28 USC, Sec. 2107, that the time for appeal from the judgment entered in the above case on March

8, 1951 be extended an additional period of 30 days to expire June 6, 1951. The ground for this motion is that plaintiff's attorney never received a notice from the Clerk's Office advising of the entry of the judgment, and only learned about the matter on May 18, 1951. The Solicitor of the Patent Office likewise received no notice and only learned about the matter on May 18, 1951.

Attached is the supporting affidavit of Edmund H. Parry, Jr., attorney for plaintiff.

Respectfully submitted,

Edmund H. Parry, Jr.,
Attorney for Plaintiff.

Granted McGuire, J.
5/24/51

* * * *

213 Filed Jun 6 1951 Harry M. Hull, Clerk

Notice of Appeal

Notice is hereby given that American Cyanamid Company, the plaintiff above named, hereby appeals to the United States Court of Appeals for the District of Columbia from the final judgment entered in this action on March 8, 1951.

Respectfully submitted,

Edmund H. Parry, Jr.,
Attorney for Appellant,
American Cyanamid Company.

* * * *

214 Filed Jun 6 1951 Harry M. Hull, Clerk

AMERICAN CYANAMID CO., Plaintiff

v.

JOHN A. MARZALL, Defendant

Civil Action No. 1887-48

American Cyanamid Co. appellant herein and The Travelers Indemnity Company, surety, appearing and submitting to the jurisdiction of the Court, hereby undertake for themselves and each of them, their and each of their heirs, executors, administrators, successors and assigns, to make good all taxable costs and charges, not exceeding the sum of Two Hundred and Fifty dollars, that the appellee may be put to or allowed if the appeal is dismissed or the judgment affirmed, or such costs as the appellate court may award if the judgment is modified.

The said surety hereon hereby irrevocably appoints the clerk of this Court as its agent upon whom any papers affecting its liability on this undertaking may be served.

Signed, sealed, and delivered this 6th day of June, 1951.

American Cyanamid Co. [Seal] by Edmund H. Parry, Jr., its Attorney.

The Travelers Indemnity Company [Seal] by Eugene F. Dunne, Attorney-in-Fact. [Seal]

Surety and amount approved June 6th, 1951, Harry M. Hull, Clerk.

* * * *

216 Filed Jun 14 1951 Harry M. Hull, Clerk

Stipulation As To Record On Appeal

It is hereby stipulated by and between counsel for the respective parties that the following parts of the record herein shall constitute the record on appeal:

1. Complaint
2. Defendant's Answer
3. Order Substituting Defendant
4. Transcript of Testimony, Proceedings and evidence stenographically reported at the trial
5. Plaintiff's Exhibits 1, 3 and 4
6. Defendant's Exhibit 1
7. Memorandum Opinion of the Court
8. Findings of Fact and Conclusions of Law
9. Judgment

217 10. Notation or Memorandum of granting of Motion for Extension of Time for Appeal

11. Notice of Appeal
12. Memorandum of $250 Cost Bond on Appeal
13. This Stipulation

Edmund H. Parry, Jr., Attorney for Plaintiff, American Cyanamid Company, Office & Post Office Address 1179 National Press Building, Washington 4, D. C.

E. L. Reynolds, Attorney for Defendant, Commissioner of Patents.

Dated at Washington, D. C., June 13, 1951.

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1 IN THE UNITED STATES DISTRICT COURT FOR THE DISTRICT OF COLUMBIA

AMERICAN CYANAMID COMPANY,
Plaintiff,
v.
JOHN A. MARZALL,
Commissioner of Patents,
Defendant.

Civil Action No. 1887-48

AMERICAN CYANAMID COMPANY,
Plaintiff,
v.
JOHN A. MARZALL,
Defendant.

Civil Action No. 96-49

Washington, D. C.,
March 22, 1950.

The above-entitled actions came on for trial on the merits before the HONORABLE MATTHEW F. McGUIRE, United States District Court Judge, at 10:45 o'clock a. m.

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41 *Robinson Bullard,*

called as a witness by the plaintiff, being first duly sworn, was examined and testified as follows:

Direct Examination

BY MR. PARRY:

Q Will you state your name, residence and occupation? A Robinson Bullard; Westport, Connecticut; occupation, engineer with the Bullard Company in Bridgeport. 42

Q What is the business of the Bullard Company? A Manufacturing machine tools.

Q What is the nature of your employment? A My business employment?

Q Yes. A I am a design and development engineer in the Engineering Department at the present time.

THE COURT: Mechanical engineer?

THE WITNESS: Yes.

THE COURT: What has been your training?

THE WITNESS: Fifteen years with the Bullard Company and prior to that Yale University.

THE COURT: Did you go to Sheffield?

THE WITNESS: Yes.

BY MR. PARRY:

Q Will you explain a little bit more fully what the nature of the business of your company is, that is what type of machines it has and what work it performs? A The machinery is large machine tools, the type that makes metal parts for the automobile industry, tanks, aircraft parts, all types of things of that kind, the brakes and the gears and the parts in an automobile, in crankshafts, the transmissions and various parts of that type. We
43 machine them and remove the burring from castings, turning out the finished or the semi-finished parts prior to other operations.

Q What type of machines do you employ for this work? A Boring machines, lathes, drill presses, grinders, milling machines, the usual machine tools that are employed in that type of business.

Q Do you employ in connection with such machines, or any of them, emulsion-type coolants such as are involved in the present action? A We do.

Q With what type of machines do you employ them? A They are used in the boring mills, the lathes, drill presses, the milling machines and the grinding machines.

Q Are you familiar with the composition of these emulsion coolants? A Yes.

Q Will you briefly advise the Court what their nature is?

THE COURT: That is emulsion coolants generally or these specific ones?

MR. PARRY: These specific ones, Your Honor, the oil-in-water.

A They usually consist of oils of a specialized nature with which certain soaps and emulsifying agents
44 have been combined and then these are later mixed with water to form oil-in-water emulsion or coolant.

Q How are those employed in connection with your machines? A Well, in the turning or milling or grinding operation heat is generated at the point where the cutting tool contacts the work, and in order to dissipate the heat and to produce better tool life it is necessary to have these cooling agents present there and they usually are directed by a pump, and in preference at the junction of the work and the cutting tool.

Q What happens to the coolants after they have been applied to the working point? A They fall back into the pan on the machine and are then recirculated and pumped back again.

Q Will you state from your personal knowledge and observation whether or not these coolants become contaminated, and if so by what type of materials? A They very definitely become contaminated by metal particles, small particles of metal, depending on the particular operation, whether it be grinding or milling, and also by dirt particles, particles of rust and scale from the metal being machined, and also from bacteria and things of that sort from the air.

Q How long can you use a coolant after it has
45 become contaminated before you have to discontinue use of it if nothing is done in the way to clarify it? A Well, it depends upon the particular type of operation, whether it be a milling operation or drill-

ing or whether it be a grinding operation. In any event though if they become seriously contaminated it is necessary to change them rather soon. I mean for instance in a milling machine it may be that we can go for a week or two weeks, or something of that sort. In a grinding machine, due to the difference in the nature of the contamination, it is often necessary to change them much more frequently than that.

Q Are the contaminating materials of a mixed nature or are they just of a single type? A Well, that varies again. You see in a milling machine or a boring machine, or lathe, or something of that sort, a large particle or chip is removed from the work by the cutting tool. These are big enough so they can be manually removed from the machine.

There are other contaminants, rust, things of that sort, and dirt and things of that sort. In a grinding operation, instead of the chip being a large particle they are extremely small particles, and in order to remove them it is usually necessary to change the coolant, and that includes the metal particles from the grinding wheel.

THE COURT: We will adjourn now for the
46 luncheon recess and will reconvene at 1:45 o'clock.

(Thereupon, at 12:30 o'clock p. m., a recess was taken until 1:45 o'clock p. m. of the same day.)

47 *After Recess*

(The trial was resumed at 1:45 o'clock p. m., pursuant to the taking of the recess.)

Thereupon—

Robinson Bullard

resumed the witness stand and was examined and testified further as follows:

Direct Examination (Resumed)

BY MR. PARRY:

Q Mr. Bullard, just before the luncheon recess I was asking you the nature of the contaminants in these emulsions that you got in the course of working with your machines. I take it that you are referring to the contaminated emulsion coming from one machine, or one particular metal, am I correct? A What I was referring to initially was the type of operation which the machine is performing will determine what the nature of the contaminant will be. If it is a grinder it will be somewhat metallic paritcles because all the particles removed in grinding are relatively small in size, so they would be the abrasive particles which break off the grinding wheel.

In a milling machine, or lathe, or something of that sort, the contaminants will be either rust particles or
small particles of chips although the major chip or
48 metal removal is of a much larger nature and
would hardly be classed as contaminants; then
there is other dirt and things of that kind that get into the coolant and eventually render it useless.

Q Do you have any operations where you have a plurality of machines fed by coolant from a common pumping system and recirculating system? A We do.

Q Would those machines be working on different type materials? A All of them are grinders but they are working on different class materials. Some would be steel, some would be cast iron, some would be bronze and possibly plastic also. Each one of them are doing grinding operations but they are all fed from a common source.

Q Then do I understand that the grinding dirt, as you might call it, from all these different machines with the different type of materials is being fed into the same coolant and then recirculated back to the different ma-

chines? A That is correct. The system consists of a central supply tank, a large pump, and then a series of distribution pipes going to the various machines and then a collecting trough at each machine and the dirty coolant and the contaminants, the grindings, and so forth, are then returned to the central tank where it is cleaned and recirculated, but the dirt going back
from each machine will be possibly of a
49 different nature. From one machine might be
steel; from the next might be bronze; and from
the next might be plastic.

THE COURT: Presumably also because of the different types of grinder used, whether it is a large rough wheel or a wheel for fine grinding?

THE WITNESS: That is correct, yes.

BY MR. PARRY:

Q You stated also that if no effort was made to clarify these coolants when they became dirty with these contaminants you would eventually have to throw them away. Why can you not use them indefinitely? A Initially, before our central system was installed, each machine was equipped with a tank and a pump, the dirty coolant going into the tank and then the individual pump pumped it back up to the discharge point at the grinding wheel. All of the dirt and the chips and abrasive particles collected in the individual sumps—

THE COURT: What is that word?

THE WITNESS: Sumps, s-u-m-p-s.

THE COURT: That is a word in the trade?

THE WITNESS: It is a trade word, yes; actually it is a tank in which all the coolant and dirt is collected. From there it is repumped back to the grinder; all of the dirt collecting there amounts to a sufficient
volume that in the space of possibly two or three
50 days or a week it becomes clogged up and the
whole thing has to be cleaned out, and in doing so

it is necessary to remove and throw away the old coolant that is mixed in it.

Q If you could continue to feed this dirty coolant back to the work would it have any effect upon the operation? A The dirt being pumped back, in other words if you got a lot of dirt in the pump with your grinding the pump will pick up dirt as well as the grinding, and this being pumped back to the wheel it produces scratches and excessive wear on your grinder and eventually will make it inoperative.

Q Do you at the present time have in your plant means for clarifying your oil-in-water emulsion coolant? A We do on all our grinders, yes.

Q What is the nature of that process in there? A It is a unit which we purchased from U. S. Hoffman Machine Company, one of these froth flotation units. It consists of a large tank, settling trough, and from the settling section it is then pumped into what is known as the cell section where the agitator beats up the froth and the dirt is brought to the top, the froth scraped off and the dirt settles with that froth down to the bottom from where it is eventually scraped off into a drum.

Q How long have you had that in operation? A Since the spring of 1946.

51 Q How is that operated? What has your experience been with that, from the standpoint of whether it is a trouble-free operation, or what? A It has been exceptionally free from any trouble so far as that is concerned. I don't recall any maintenance problems which we have ever had with it in the four years we have had their unit in there. At times liquid is occasionally added and some make-up coolant to it, as evaporation and losses take place. Periodically, I think about every four to six months at the present time, the coolant is taken out and the whole unit is just cleaned out and generally checked over. It would not

necessarily have to be done even that often but it is done as a matter of precaution, that's about it.

Q Do I understand it has been your experience with this clarifying system that you do use the same coolant for a period of from four to six months? A That is correct, yes. With the only addition of minor make-up volume we use the same coolant for those periods.

Q What was your situation in 1940 with respect to coolants? Did you clarify them then? A No, we did not. We had, as I say, a large group, a similar group of machines then as we now have, each operated with its own individual tank and pump. We had been doing a
considerable amount of research and investigation
52 in order to find some satisfactory means of clarifying our coolants.

Q How often did you have to throw away the coolant, or how often did it have to be changed? A It varied from machine to machine but we kept a crew of two men busy continuously cleaning the various different machines out. They would be stopped, the dirty coolant taken out, tanks cleaned and refilled, and there was a daily make-up volume of possibly 150 to 200 gallons of new coolant added to the various different tanks in the machines because of losses in cleaning out and things of that kind.

Q What shutdown period would that amount to on a machine? A Again it varied with the machine but anywhere from half an hour to two hours with a machine. That might occur sometimes as often as two or three times a week if there was very heavy metal removal.

Q You stated that you had made some investigation with respect to clarification. Will you briefly describe what you found? A Well, initially, I believe in 1940 or it may have been 1941, we looked into a unit supplied by the U. S. Hoffman Machinery Company, a filter of a type known as a pre-coated filter. Would you care to have me describe generally what that filter is like or have me clarify it?

That was one type of equipment which we had tried out.

53 We had tried out a centrifuge made by the De Lavall Company in Poughkeepsie.

We had investigated another make of filter, magnetic filters, and things of that kind. None of them had proved particularly satisfactory on actual test in our plant, primarily from the standpoint they were either too costly or the initial installation would have been so excessively costly and bulky or that the operating expense and problems involved with them, that is maintenance, cleaning at frequent intervals, would have been such we didn't consider them a practical installation and accordingly we rejected any of those and did nothing about it.

Q Are you acquainted with Dr. Booth and Mr. Morash who are the applicants on the invention involved in this suit? A I am.

Q When did you first become acquainted with them? A I believe it was in the spring of 1942 that Dr. Booth wrote to me stating that they had discovered a new process for cleaning coolants and asked if we would be interested in trying it out. My reply naturally was in the affirmative as we were investigating every source of coolant clarifier that we could find.

Q Did you investigate any further then? A We did. In the fall we submitted samples of our dirty grinding coolant to the Cyanamid Company for
54 testing. In fact I went down to their laboratory
to watch the operation.

Q What was your reaction to the operation? A Well, I was frankly very much surprised that it succeeded as well as it did because we had seen a good many different filters and most of them had been so completely useless as to be even not worthy of consideration.

This was obviously simple and did an amazing job. It removed so nearly all of the dirt that it was the practical thing from our standpoint and presented the first really practical method of cleaning coolant which we had seen.

After that Dr. Booth suggested that we might like to try a small test unit in our plant. I don't believe one was available at that time. Eventually in the fall of 1943 a small test unit was available and we did try that out on one of our grinding machines in the same manner we had tried other filters and the centrifuge.

Q And what was your reaction to the operation of that unit on your own machine? A Again, extremely favorable and very much surprised that it really did the job. It surprised all the operating personnel, the foreman of the department and the other factory supervisors; they were all of them very much amazed at the whole operation, how simple it could be that we could do it on that basis.

Q If someone today offered you a system of
55 clarification involving a centrifuge would you consider it for installation in your plant for clarifying these coolants? A I dont believe we would. We considered them before and rejected them because of their excessive cost and being impractical and I certainly don't believe that we would consider them again today.

Q I understand that you did have one of those De Lavall centrifugal units in your plant? A We tried it out on the same grinder on which we tried out the unit made by the Cyanamid Company.

Q Will you briefly describe your experience with that? A It was connected to the machine, that is to the coolant tank or sump that I referred to previously, and allowed to operate for approximately two weeks. It cleaned the coolant very satisfactorily, no doubt, but the operating cost on it was excessive. It had to be stopped periodically for cleaning. The cleaning time was too high and the cost of the unit to handle an adequate volume of coolant would have been excessive.

Q What do you mean by the cleaning time was too high? A Well, that type of a unit takes the dirt out of the coolant and deposits it inside of a rapidly whirling bowl and it builds up in there until eventually it has to be stopped or no further cleaning action will take place.
You simply have to stop the machine then, remove
56 the lid and scrape the collected dirt out of the
machine. That usually takes half or three-quarters of an hour to do. While that is going on you are not cleaning your coolant.

Q Would you say that centrifugal cleaning system was a continuous operating system within practical limitations of your requirements in your plant? A It certainly would not have been in that application, no. If the volume of dirt in the system had been extremely low it might have worked out more nearly that way, but it certainly would never be classed as a continuous system.

MR. PARRY: You may cross-examine; direct examination closed.

Cross Examination

BY MR. MOORE:

Q Will you repeat for my benefit what the business of the Bullard Company is? A Machine tools.

Q You sell machine tools? A We make and sell machine tools.

Q But the installations that you are referring to are installations made in your own plant? A That is correct.

Q You made installations on the lathes, milling machines, and so forth that you were in turn using to
57 make these machine tools? A That is right, yes.

Q And you bought the floatation unit that you installed from the Hoffman Company? A That is correct.

Q What is the full name of the Hoffman Company? A U. S. Hoffman Machinery Company.

Q What do they generally deal in? A Laundry machinery, I believe; filters; and more recently this coolant clarifier which we bought from them.

Q You say that you used a filter for experimental purposes that you had bought or received from Hoffman? A That is correct; we had one in there on trial.

Q You had a centrifuge on trial and that was from DeLavall? A That is correct.

Q Your objection to the centrifuge was primarily, wasn't it, that it was uneconomical? A Well, now, do you mean from an operating standpoint or from the initial expense?

Q From a businessman's standpoint. You are a businessman, aren't you? A I hope so.

Q Wasn't that your main objection to the centrifuge, that it was uneconomical from a businessman's standpoint? A It was impractical, that is correct.

58 Q Uneconomical? A Well, simply impractical.

Q You were really interested in expense, isn't that true? A That is true, yes.

Q And you thought the centrifuge was too expensive for you to operate as an installation under the machines you were using in your shop? A It was too expensive to buy; it was too expensive to operate; it was impractical to operate from the standpoint it would have required excessive service on it.

Q And was uneconomical to operate? A Well, if you insist, yes.

Q That is the truth of the matter, isn't it? A Certainly.

Q What did you find as to the installation of the filter? A What did we find?

Q Yes. What was your experience with the filter as to expense? A Again, it was impractical from any operating standpoint. We couldn't have used it practically due to the service required and the fact that the system would have been bulky and the amount of service required would have been such that we would not have
been able to get the economies which we would
59 have hoped to achieve through such a system.

Q Was the filter a filter in general use? A Yes.

Q You referred to a sump. Could that also be called a settling tank? A Well, they have been designed as such but they certainly don't work as such.

Q They are intended to work as such? A They are intended to work as such but they don't work.

Q They didn't work satisfactorily for you? A No.

Q And had you put these sumps on your own machine or were they originally part of the machine? A They were part of the original equipment.

Q Can you describe them, say, as to proportions and measurements? A It depends on the volume of coolant they are designed to handle. They might be three or six feet long, three feet wide, two or three feet deep.

Q Limit yourslf to some lathe that you may specify and describe the sump as applied thereto, just one particular specific lathe. A Those on the lathe aren't even
intended as a settling tank. Those on the grinder
60 attempt to be settling tanks.

Q Describe the sump on a grinder and indicate what the grinder is supposed to do. A The grinder is supposed to remove metal from the work-piece, and in so doing it brings the metal chips removed and the abrasive particles which break off the wheel down into the sump with the dirty coolant.

Q Have you any particular grinder in mind performing some particular operation that you can describe the size of the sump with that particular grinder so that we can get something quite tangible? A Well, a grinder for grinding shafts, suppose it takes three or four feet between the centers and work up to six or eight inches in diameter. It might have a wheel which would be three feet in diameter and two inches wide on the face. A machine such as that might conceivably be as long as from here over to where you are sitting. The sump with a machine of that kind would probably be five or six feet long, possibly three feet wide and two or three feet deep. It depends on the individual designer's choice in the matter.

Q On that particular type of machine those would be the general dimensions? A Something of that sort, yes.

61 Q Grinding cam shafts? A It could be used for grinding cam shafts. It is a special type of cam shaft.

THE COURT: Did I understand you to say the so-called sumps are what have been called here settling tanks, whereas the filters would have tanks applied to the individual machines, but under the Hoffman apparatus you had a central tank and you had the coolant carried to the machines, that is to the milling machine, the grinder and the lathe, all from one central source performing the operation required, and then went back to the so-called central sump?

THE WITNESS: That is correct, yes.

THE COURT: And that is one of the beneficial results that I took, by way of inference, that you had in mind when you said that the new system, so to speak, was more satisfactory and required less maintenance?

THE WITNESS: Very much so. There are many other advantages involved in using this particular system; I haven't volunteered to enumerate them. If you wish I can name some.

THE COURT: You have enumerated them in a sort of negative way by saying that the older ones were not practical installations.

MR. MOORE: No further questions.

THE COURT: You may step down.

(Witness excused.)

Thereupon—

62 *Norman Morash,*

a witness called by the plaintiffs, being first duly sworn, was examined and testified as follows:

Direct Examination

BY MR. PARRY:

Q Will you please state your name, residence, and occupation? A Norman Morash; residing at 206 Watchung Fork, Westfield, New Jersey. I am a project engineer from the Chemical Engineering Department of the Calco Chemical Division of American Cyanamid Company.

Q Are you the Norman Morash who is named as joint inventor in the application involved in this Civil Action No. 1887-48? A I am.

THE COURT: Can I infer from what you said—you say Project Engineer, Chemical Engineering Department—can I assume or is it so that your basic professional training was as a chemical engineer?

THE WITNESS: That is right.

THE COURT: And you are a graduate of what institution?

THE WITNESS: Tufts College.

THE COURT: Medford, Massachusetts?

THE WITNESS: Right.

THE COURT: A good school; when did you
63 graduate from Tufts, may I ask?

THE WITNESS: 1937.

BY MR. PARRY:

Q When was the present invention developed by you and Dr. Booth? A It was in the fall of 1941.

Q And was there any difference in your occupational duties as of that period as compared with the present time? A Yes. At that time I was employed by the Metallurgical Chemical Section of the Stamford Research Laboratories as an ore-dressing engineer.

Q Are you a chemical engineer? A Yes, sir.

Q Will you briefly describe your background by way of educational qualifications and prior experience to 1941? A I graduated from Tufts College with B. S. Degree in Chemical Engineering in 1937; did a year of graduate work in physical chemistry until 1938. I was then employed by the American Agricultural Chemical Company as a research engineer and for a year and a half developed various chemical processes. At that time they transferred me to the phosphate rock mines in Florida.

Q What was the nature of your duties there? A I was plant development engineer and as such it was my
duty to make a study of the various plant opera-
64 tions to try to improve their efficiencies and in
that line I did considerable work on flotation be-
cause they use flotation for beneficiating phosphate rock.

Q How long were you on such work in Florida? A A year and a half.

Q Does that carry down to the time you came to American Cyanamid Company? A That is right.

Q When you came to American Cyanamid Company at Stamford—and I think you mean Stamford, Connecticut— A I first went with Chemical Construction, which is a subsidiary of American Cyanamid Company, and then after about a month they found out about my mining experience and they transferred me to the Mining Division, or Metallurgical Chemical Division at Stamford.

Q Did you in your work at Stamford pursue any work in connection with froth flotation prior to the development of the present invention? A I did. I did quite a bit of work on phosphate rock flotation.

Q In phosphate rock flotation will you explain briefly what is involved with respect to what the purposes of treatment are and what is accomplished? A Well, maybe I can give a description of the mining operation and that will show.

65 The first thing, the phosphate rock is in a matrix underground and the procedure is to strip the top layer, so-called overburden, off of this matrix with draglines or hydraulic mining—there are several different methods—and then you get down to the matrix which is a mixture of phosphate rock and material which is of no value to the operation.

Now then, after that overburden is stripped off, the matrix is then mined either by hydraulic mining or some other method and pumped to a washer. There the coarse rock is screened from this material. This coarse rock has a high percentage of phosphate rock. By coarse rock I mean material that is say plus 28 mesh particle size.

Q How big would that be in terms of inches? A 28 mesh means 28 openings to an inch on a screen.

The material that went through those screens was then sent to a flotation plant.

This material was low in phosphate rock but there was a tremendous amount of that material, and therefore you had to recover those phosphate fines which are minus say 28 mesh and plus 325 mesh.

This material which went to this flotation plant was mixed with a reagent and then the material passed into a flotation machine.

Q What was the nature of the reagent? A They were using a mixture of caustic soda, fuel oil
66 and fatty acid.

Q And what was the purpose of this reagent? A It would cause the phosphate rock when it entered this flotation machine, due to the action of the unit, to float to the top of the machine and separate itself from the sands and unwanted materials which passed on through the machine.

THE COURT: It was in the nature of precipitation —you were trying to recover the phosphate?

THE WITNESS: That is right.

THE COURT: In other words, you were trying to recover what you missed in the original take?

THE WITNESS: That is right. You have a mixture of A and B and you want to separate A from B and the way you separate it is to put it through a flotation machine. A, due to the flotation action, rises to the top and B is carried on out.

THE COURT: The reason I used the term precipitation is because sometimes you use a reagent and the precipitate always comes down, but in this part of it goes up?

THE WITNESS: What you want goes up. However, there are some mining operations where they run just the reverse. So that was the work that I did on flotation.

BY MR. PARRY:

Q You spoke of the fines of the phosphate rock going up, being floated by the froth, is that correct?

67 A That is right.

Q And what was done with that? A That was skimmed off by a mechanical skimming device and went to a large tank where it was dewatered and then by rail shipped back to a drying plant and then sold as high grade phosphate rock.

Q What happened to the rest of the rock which was still in the machine? A That was sent out to the tailings, to waste.

Q What happened to the liquid in the machine? A Most all the liquid went right out with this rock tailings and was then sent to a settling pond whereby it could be brought back again or sent to waste, whichever you decided to do.

Q Was the main composition of the liquid vehicle in which this separation of the different components and phosphate rock takes place, was that essentially water, except for this reagent? A That is right.

Q About how much reagent would be used on that? A You add in reagent to the amount of solids you have present. In other words, for one ton of solids you might add, oh, just roughly—I have forgotten the exact amount —but say half a pound of caustic soda and a pound or say two pounds of fuel oil and one pound of fatty
68 acid; there is a total of say three and a half pounds of this flotation reagent to a ton of ore, which ton of ore is in turn diluted with the water when you send it to the flotation machine.

Q In your opinion are there any important differences between that phosphate rock operation, that is the mining recovery operation, and the froth flotation operation in the present application? A They are not the same at all; there is no comparison of the two. In one you are running a separation and in the other you are running a substantially complete clarification.

Q By a separation you mean solids from solids? A Separating solids from solids.

Q And by clarification you mean what? A Separating substantially all of the solids from the liquid.

Q And how are the solids taken off by the froth flotation under the process of the invention in suit? A You mean in the coolant?

Q Where are they taken off? A Off of the top of the machine.

Q How did you happen to evolve this invention with Dr. Booth? Will you state it very briefly? A We were approached by a company which makes water-soluble oils and told that the machine tool industry had a prob-

lem of cleaning these oils or getting them in a
69 proper reusable condition, and they asked us if
we could, in line with our mining experience, develop a chemical reagent, a settling reagent, which they could add to their oil so that it would cause all of the dirt to settle out so that the coolent could be returned clean to the grinder.

Q What is the difference between a settling reagent and a foaming reagent? A The settling reagent will cause everything that is held in suspension to rapidly settle to the bottom of the chamber.

Q And a foaming agent? A A foaming agent is a material which will attach itself to a particle and which has the property of allowing the air to attach itself to this agent and cause the particle to float to the surface.

Q In this froth flotation operation is it a matter of which particles are finer as to which the air bubbles take up. A With regard to coolant clarification you mean, or with regard to mining operations?

Q I made my question general. Need I make it more specific? A Well, in coolant clarification for some reason or other everything floats. It operates in such a way that all of the material, regardless of size, that is
of standard size, of the grinder material which you
70 would get, may be floated, may be lifted up.

THE COURT: Do I understand you to say that in the mining operation the recapture of the finer phosphate could not be compared in any way with the so-called clarification of coolants?

THE WITNESS: That is right.

THE COURT: One was the separation of a solid from a solid and the other separates the solids from liquid?

THE WITNESS: That is right.

THE COURT: I don't follow you there; I wish you would explain that again. I can't follow that conclusion because aren't you separating phosphate from a liquid?

THE WITNESS: That isn't the idea of the separation. The separation is to recover a salable, marketable phosphate rock.

THE COURT: Which is a solid.

THE WITNESS: Which is a solid and contaminated with sand.

THE COURT: Oh, I see what you mean. In other words, you are merely using a reagent process to recover the phosphate and do away with the sand, and that is what you say separates solids from solids?

THE WITNESS: That is right.

THE COURT: But in the operation the clarification
is separating the solids from the liquid; in other
71 words, taking out the ultimate substance with the
net result that the liquid used as a coolant can be
used again?

THE WITNESS: That is right.

BY MR. PARRY:

Q You say you took these emulsion oils— A (Interposing) They brought into us three different samples. One was the straight oil which they market.

Q Was that an emulsion? A That is material which when added to water forms the emulsion.

Q Was that the oil and lubricant? A That is right; they are called water-soluble and they brought in a sample of that; they brought in a sample of the sludge which one can recover from a grinding operation; and then they brought in a sample of dirty coolant and they asked us to work with those to see if we could develop some sort of a chemical reagent which could be added to make the material settle.

Q Did they ask you anything about trying to make them float? A No. No, they were after a chemical reagent which they could sell in their oil. That was their idea, to make a chemical which they could sell.

THE COURT: You mean put in their oil and sell to the United Products, so to speak?

72 THE WITNESS: That is right.

THE COURT: So that when the oil would be used they would have this reagent which would result in precipitation?

THE WITNESS: That is right. We took that sample into the laboratory and as is the general custom, when you get a sample of material you first play around with it to get the feel of it; you want to know just what it does, and all—

BY MR. PARRY:

Q (Interposing) This was the sample of the oil? A The dirty coolant.

Q Oh, the dirty coolant? A We took that sample and poured it into several graduated cylinders. As I remember it they were probably 1000 cc. graduated cylinders, and one we kept as a blank—

Q (Interposing) Who is we? A Dr. Booth and myself. Another one we added say settling reagent A; to another one settling reagent B which we knew had worked as a settling reagent in the ore dressing field, and tried them out.

The blank, we noticed, when we would take that and shake it up that some of the contaminants would go to the top of the bottle and some would stay down at the bottom. Then that impressed us and we said why can't we take this and put it into a flotation machine and see if we can remove that material that goes to the
73 top so easily, and then we could afterwards pass the other material that was on the bottom out and maybe settle it out. So we took a sample of it and put it into a laboratory flotation machine.

Q Was that machine essentially of the nature shown in Figure 1 of the application involved in Civil Action No. 1887-48? A Essentially the same. That unit is a continuous unit and our unit was a batch unit.

Q Is it a so-called Fagergren machine? A That is right.

Q And what happened? A We dumped the sample into the machine, agitated it for a moment and allowed the air to come in and then the amazing thing happened which was that everything "poufed", like that, came up to the top of the liquid.

Q By "everything" you mean what? A All of the solids that were present.

THE COURT: You mean not only the solids that were on top in the bank but the solids that were on the bottom?

THE WITNESS: That is right; everything came up; and that was really amazing because in the light of our mining experience we expect to look down at the bottom and see a lot of material down at the bottom.

We skimmed that off with a hand paddle, and at first we just got what is known as a sort of dead float;
74 when this stuff came up in such a hurry it formed a thin layer on top and we skimmed that off and we noticed as we were getting most of it off then we started to get a very lively bubble back in the unit, bubbling very effervescently. Then we shut down the machine because we couldn't believe it would work like that, and drained the sample out of the bottom and looked at it and we could find no solids in it.

So then we took it over to the laboratory bench and poured it through a filter, a Buchner suction filter and we found there were no solids remaining on the filter paper, and that therefore we had, rather than just obtaining a separation of the two, what we had done was to float everything.

Q Just to make one point clear, do I understand what you speak of as the dirt in this coolant of the sample given you was a mixed dirt? A That is right.

Q Could you identify what was in it? A It was material that had come off a grinding machine which contained the metal particles due to grinding; grinding grit from the wheel and some organic binder which is used in order to hold the wheel together.

THE COURT: You were using the then residue which contained the oil and the contaminants in which they went through the machine in the process of lubricating
it and presumably went into this sump and were
75 taken out and then you got that as the sample
that Mr. Bullard talked about?

THE WITNESS: That is right.

THE COURT: And that was the problem presented to you to solve?

THE WITNESS: That is right.

THE COURT: In other words, to see if you couldn't in some fashion effect, by virtue of the problem presented to you, a real saving, so to speak, so that the oil could be used again, and the problem you had was the sludge which was in the oil?

THE WITNESS: That is right. They had asked us to find some way of settling it.

THE COURT: And if you could get that out then you could use the oil from the standpoint of what was left?

THE WITNESS: That is right. The trouble with most of these settling tanks is that some material stays right in suspension and goes right back into the grinder and that is what causes the trouble, and they felt if they could only add a material that would make all the materials come down then a settling tank would be satisfactory.

THE COURT: And the result of your experience was that instead of all the material going down, all the material went up.

THE WITNESS: That is right.

BY MR. PARRY:

76 Q In this work, Mr. Morash, did you add any flotation reagent or other material at that time? A At that time we didn't. We ran another test later on to see how it would work if we added a chemical reagent.

Q But as of this time this was just the dirty coolant? A Just the dirty coolant which we had received from the oil company, we poured into the machine and tried it out.

Q In your experience with mineral separation was there any comparable situation where you would float off minerals with froth without adding a reagent? A Oh, no. You have to add a reagent in order to get mineral separation.

THE COURT: I thought you said you used air, because when you took the top layer off with the handle paddle you noticed an effervescent situation and that would only occur by the addition of air.

THE WITNESS: That is right.

THE COURT: So that you did use air?

THE WITNESS: That is right.

BY MR. PARRY:

Q You say you added no flotation agent of any kind in this treatment? A That is right.

Q As of the time you did this work had you in your experience ever seen anything where you could
77 have a flotation process operate to bring any type of solids off of the top without adding a reagent? A No, there is no mining operation which will work without a reagent.

Q So I understand that this work you did was unique with respect to the fact that no flotation reagent was added, and that all of these mixed contaminated solids came off with the froth at the top? A That is right.

Q Just to clear up one point that the Judge raised with respect to air, will you briefly take the drawing in your application, which I show you here, and just explain where the air is and what it does?

I think, Your Honor, you have a copy of the drawing here. I am speaking of Fig. 1 of 1887-48. A The machine is so set up that the rotor 11, which is driven by rotor shaft 12, which is in turn connected with a source of power—

Q What does that do? A That rotates at a high speed and in rotating it sucks air down standpipe 14 and whirls it out, as those little bubbles indicate, into the main body of the tank. In whirling it out those particles hit the stator bars 10; they are stationary bars. The rotor is so-called because it rotates, and the stator is so-called because it is stationary.

78 That more or less coarse air bubble is whirled out at terrific speed, hits this stator bar and is broken up into very minute air bubbles.

Q And what happens to those bubbles? A Those bubbles, due to their buoyancy, tend to rise to the top of the unit, to the top of the liquid. In rising they attach themselves to these solid particles and carry the solid particles along with the air up to the top of the liquid. Then the solids are skimmed off by this skimming device which is No. 15 and collected in through 17.

Q The term—I may have been the one to use it—"froth" has been used; will you explain what you mean by froth and what produces it? A Well—

THE COURT: It is one of those simple terms.

THE WITNESS: I just had a milk shake for lunch and the top of it had a lot of bubbles on it, and you could see that there was some chocolate up there.

THE COURT: I had a piece of lemon meringue pie and I saw the same thing.

THE WITNESS: That is the description of a froth. In other words it is an air bubble which is completely surrounded by a liquid.

THE COURT: Then do I correctly understand now
that there was no introduction of air into this
79 experimental cylinder that you were talking about,
but that the air was caused by the action of the
rotator?

THE WITNESS: That is right.

THE COURT: By virtue of oxygen being present?

THE WITNESS: That is right. In this test apparatus, due to the action of the rotor, we suck air down the shaft and then whip it out into the machine.

THE COURT: In other words, there is no introduction of air from an outside source?

THE WITNESS: No.

THE COURT: And the rotation then of the rotator stirs up these air bubbles, and these air bubbles are what you say brings up these fragments of pulp to the surface?

THE WITNESS: That is right.

THE COURT: And causes the separation that you indicated. You did, did you not, indicate that air was actually introduced from the outside through hood or member 14?

THE WITNESS: That is right.

THE COURT: In other words, you do bring in air?

THE WITNESS: You bring it in due to the action of the machine.

BY MR. PARRY:

Q You suck it in? A Yes.

THE COURT: Then that is clear. That is
80 what I thought originally but then as he went on
I became confused.

BY MR. PARRY:

Q Where does this froth develop and what produces it? A The froth is produced by the air and finally ends up at the surface of the liquid.

Q Where are these materials, the solids that you say are drawn up? A Due to the agitation as this liquid comes in it is forced around through a part of the tank and then the air catches onto these particles which are distributed throughout the tank and lifts them to the very surface.

Q Where is the froth and where are the solids then? A Well, at the end the froth and solids are all together at the top of the machine.

Q Is that froth, the contaminated froth, taken off? A That is right.

Q They are taken off together? A That is right.

THE COURT: How are they taken off, as indicated in Figure 1? You said in the experiment you used a hand paddle.

THE WITNESS: That is right. In that picture it shows an automatic skimmer.

THE COURT: 15?

THE WITNESS: That is right.

BY MR. PARRY:

81 Q Did you pursue this work further after your initial experience with treating these contaminated coolants? A Yes, we did. We were so surprised at the operation then we thought, well, this must be something new, and we tried to find out then what was being done out in the industry. All our previous experience had just been the call from this oil company.

So then we went out to see what was being done out in industry in this coolant work.

Q What did you find? A We found out by talking to such people as Yale & Towne Manufacturing Company, and the Norma-Hoffman Bearings Company—not to be confused with this U. S. Hoffman Company, mentioned before—that they had a tremendous problem in trying to remove the solids so that they could get clean coolant back on to their work-piece without having to have all kinds of shutdowns in order to accomplish it.

After we had found that out then we asked those people if they would give us a sample of their dirty coolant, and we brought it into the laboratory and tried it out in our laboratory flotation machine and found that these coolants acted the same way as the material which we had got from the oil company.

In other words the sample was put into the flotation
machine, the machine started up, started pumping
82 air down there, and immediately all of the solids
came right to the surface, and they in turn were
very much amazed that such a thing could happen, and the fact that it should be so simple.

And as a result of that we put together a so-called pilot-scale model and we took that out into the plants—well, we took it to Yale & Towne and hooked it up with one of their grinding machines; we took the coolant directly off their grinding machine and passed it through our flotation unit, clarified it, and then passed it back on to the work-piece by their special pump that they had there.

Q How did the operation work with respect to the clarification of the coolant? A It was most satisfactory. In fact, just to try to see if they couldn't stump us, some of the Yale & Towne men took great handfuls of this sludge, and in fact there were roughly 8,000 grams they took, and just tossed it right into our little machine. The thing just went right on beautifully recovering froth and this sludge and getting it out and sending the clarified coolant back.

Q Did throwing that dirt in make any suggestion to you with respect to the capabilities of your machine? A We certainly were tremendously impressed that the thing should work so well.

Q Why? A Because you just don't expect
83 something like that to do that good a job.

As a matter of fact on some of the tests that we ran we removed solids down to the order of one part per million. You get more solids than that in your ordinary drinking water.

Q In any of these plants that you investigated were they having any coolant clarification using centrifugal treatment? A Yes. Norma-Hoffman had a centrifuge in their plant. They had a centralized system whereby the coolant from all of a series of machine tools went through a trough into a huge sump tank, and then from that they pumped it upstairs to a centrifuge.

Now, this was a fair sized centrifuge but they could only put one-third of their total flow through this particular centrifuge.

Q Are you speaking from your personal observation? A That is right; and then that one-third went through the centrifuge and was brought back together with the two-thirds and then put into the machine.

Q What was done to the two-thirds that didn't go through the centrifuge? A That was just held in a by-pass tank.

Q Was that clarified in any way to remove the contaminants? A Only as much as had been re-
84 moved originally in the huge settling tank which they had. That was not further clarified.

They clarified one-third in the centrifuge and mixed that one-third. That was the best they could do, by taking one-third that was relatively clean and mixing it with two-thirds of partially clean material and sending it back to their grinders.

Q Was this a re-circulating system? A That is right, and they were not satisfied with that.

Q Just to make one point clear, do I understand that taking any flow of dirty coolant, after it came from the machine, that came down through a pipe and then there are two branches in that pipe, one through a centrifuge and part of it went through that, one-third went through that, and then the other by-passed that centrifuge? A They had the centrifuge up on top of the building. They pumped from the settling tank to the centrifuge on the top of the building, and at that point they had the second small tank and their centrifuge. After the part of it went through the centrifuge it was joined together in that small head tank way upstairs and then it would go by gravity to the machine tools.

Q Do I understand that for each gallon of flow of the then contaminated oil and water coolant they
85 were only clarifying one-third of a gallon? A That is right.

Q And the other two-thirds was still dirty? A That is right.

Q And it went back to the grinding machine still dirty? A That is right; the total was still dirty.

Q You say that the company was not satisfied. By "company" I mean Yale & Towne. A Well, this particular company was the Norma-Hoffman Bearings Company.

Q Why were they not satisfied? A Because it was going back too dirty to give them good operation back on their machine tools.

They were grinding precision bearings which had to be very carefully ground.

Q Did you have any further experience with this company? A Yes. After having demonstrated this pilot plant unit we sold to them a full scale unit.

Q You mean of the invention involved here? A That is right, the full scale flotation machine.

Q Did you in fact install such a machine in their plant? A We installed the machine in the basement of their plant and it worked very satisfactorily.

86 Q You observed it personally? A That is right.

Q By satisfactory what do you mean? A It took out more dirt, much more dirt, than their previous operation.

Q Would it handle their whole flow of dirty coolant? A That is right; it would take all of the flow.

Q Do you know whether that system is still in operation? A It is my understanding that it is still in operation. I have not seen it personally in several years.

Q Have you had any complaint, within your knowledge, or has American Cyanamid had any complaints, within your knowledge? A Not within recent years anyway.

Q As of the period subsequent to the installation did you personally have any complaint from the Norma-Hoffman Company? A Oh, I think we had to straighten out a few minor difficulties on the machine to get it so that it would function smoothly in this new operation.

Q Was that any more than might be expected with the installation of any new machine in a plant? A No, I wouldn't think so. In fact, I have yet to see any machines going in on new operations that didn't have to be altered slightly.

87 Q Based upon your experience in the actual mining operations with froth flotation treatment there, would you say that the experience that the Norma-Hoffman Company had with this treatment of coolants was a commercially satisfactory operation? A Very definitely.

MR. PARRY: Direct examination closed.

THE COURT: We will suspend for five minutes.

(Short recess.)

Cross Examination

BY MR. MOORE:

Q Mr. Morash, you referred to your employment by the American Agricultural Company. A Chemical.

Q American Chemical Company? A American Agricultural Chemical Company.

Q Is that a subsidiary of any other organization? A No.

Q Hooked up in any way with Tennessee Iron & Coal, for instance? A Not to my knowledge.

THE COURT: Reorganized sometime ago?

THE WITNESS: I don't know.

THE COURT: I think it was because I handled an estate in which there was a lot of that stock.

88 BY MR. MOORE:

Q Was Tennessee Iron & Coal also doing phosphat recovery work in Florida at the same time? A Not to my knowledge, no, unless they happened to own some other company, but the main ones were Armour and Swift, International American Cyanamid actually has a mine down there too, and American Agricultural. Those are the main ones that are down there.

Q You referred to the use by the American Agricultural Chemical Company of the froth flotation process. A That is right.

Q They were using that process to recover phosphate as a value? A To separate phosphate from quartz or silica so as to improve its grade.

Q In so recovering phosphates they used a slurry, didn't they, of phosphate rock? A That is right.

Q And water? A That is right.

Q And what else did they add to that? A These three chemical reagents which were caustic soda, fuel oil and fatty acid.

Q There is no such thing as fatty acid, is there? A Well, the material that we used was called for the most part Reagent 708. 89

Q It wasn't a specific fatty acid, was it? A It was a mixture of fatty acids.

Q What specific fatty acids were included in that mixture? A You got me, that's a long time ago.

Q Let's say this, they were specific fatty acids? A That is right, they are a mixture; they are obtained from the paper industry.

Q And might include oleic? A I don't know, I wouldn't say what acids are in there. Dr. Booth can probably tell you.

Q Caustic soda would be a commercial product? A That is right.

Q Fuel oil you were using some particular fraction? A We were probably using Bunker C fuel oil.

Q A recognized commercial product? A That is right.

Q So the slurry was made with these chemical reagents, water, and the ground ore— A That's right—not ground ore, it wasn't ground—natural ore.

Q It had been reduced in size? A No, the coarse had been screened out; it was the same size as it was mined.

90 Q You were using what had failed to pass through a 28 mesh? A No, it passed through the 28 mesh.

Q You were using minus 28 mesh material? A That is right.

Q And you were recovering the phosphate from that? A That is right.

Q And you were recovering that phosphate from a slurry? A That is right.

Q So that you were recovering phosphate from a liquid, were you not? A We were recovering phosphates from a slurry.

Q Which would be a liquid? A No, the slurry isn't a liquid; the slurry is a mixture of solids and liquid.

Q You wouldn't say the slurry was a solid? A No; slurry is a mixture of solids and liquid.

Q And you were recovering phosphate from the slurry? A We were recovering phosphate from the slurry, right.

THE COURT: What does it partake of the most, the liquid or the solid?

THE WITNESS: About 20 percent solid and 80 percent liquid.

THE COURT: In other words, it floats slowly?

THE WITNESS: That is right; it can be pumped.

91 BY MR. MOORE:

Q A settling reagent may also in certain cases be a froth flotation reagent, is that true? A That is right.

Q You said as much in your application Serial No. 443,816, didn't you? A Probably did; I don't remember the exact wording of it.

Q If you were dealing with the recovery of particles of wool fat from a wool washing effluent you wouldn't expect to use a froth flotation reagent, would you? A Well, I am not an expert on the flotation of wool grease. I mean I don't think that I am the one you should ask on that.

Q I am asking you. I say on general principles you wouldn't expect and see the need of an additional agent? A I would have to see the particular sample, get the feel of it to find out if I had to have a reagent or not. I can't say yes or no until I played around with the thing to find out what would happen.

Q Is the Minerals Separation, Limited, of London, England, a well known company in the field of flotation? A I don't know; I have not heard much of it.

Q Haven't you heard of the pioneer work they did, well, prior to your graduation in 1937 from Tufts?

92 A I was a chemical engineer; I was not a mining engineer studying that.

Q I understood you to say that your company, that is the American Cyanamid— A That is right.

Q —sold a flotation machine to the Norma-Hoffman Bearings Corporation. A Corporation or company, yes.

Q Where was that machine obtained? A Where was it obtained?

Q Yes. A We had it fabricated on the outside, but I don't recall the exact person who fabricated it, but of course we are a chemical company and it might have been fabricated by the Maintenance Division of one of our plants or it may have been purchased on the outside. Mr. Griffin can probably tell you where that was made. It was made according to our standard design of flotation machine.

* * * *

93 Q It is a conventional Fagergren machine? A That is right.

* * * *

94 MR. PARRY: Now, Your Honor, we are going to show you as a phase of the demonstration the treatment of these contaminated coolants.

I am informed that the dirty coolant that we have, which came from a grinding machine, is a part of the original batch which was used in the original work away back in 1941, about which Mr. Morash testified. That may be incidental but it happens to be a fact. We are going to show that operation and what happens to the dirt and to the contaminants.

We are going to demonstrate with the same machine, which is a standard Fagergren laboratory model machine, a relatively small machine, also what happens in a mineral flotation such as Mr. Morash has referred to, and for the record I might state that we have arbitrarily picked out to show the flotation of graphite from a mixture of quartz and mica. We merely picked those out because they are of different color and you can see the difference, and the quartz and mica will be mixed in a body of water, not in a part of our coolant. However, we will add a little of our emulsion as a flotation reagent, just as flotation reagents are added normally in a mineral flotation, and we are to show the fact that with an amount of reagent, even of the nature of our coolant, there is still a selective separation as between the different minerals. 95

(Thereupon, a short recess was taken during which time the machine was demonstrated to the Court and

Counsel, after which the Court reconvened and the following proceedings were had in open court:)

MR. PARRY: Did you have any comment you wished to make on the demonstration, or did you, Mr. Moore?

MR. MOORE: No.

THE COURT: My comments were made downstairs, and the only comment I had made was in the nature of an interrogation, which had been answered, in other words, the point of experiment to show the difference of
what was done in the mining operation to recover
96 phosphate and what was done with the type of
thing that we are concerned with here.

MR. PARRY: Exactly. Mr. Bennett, will you take the stand?

Thereupon—

Gordon C. Bennett,

a witness called by the plaintiffs, being first duly sworn, was examined and testified as follows:

Direct Examination

BY MR. PARRY:

Q Will you state your name, residence and occupation? A Gordon C. Bennett; 96 South Main Street, Middletown, Connecticut. I am semi-retired.

Q Did you ever have any connection with the U. S. Hoffman Company, whose name has been mentioned earlier in the testimony? A Yes.

Q What connection? A I was district sales engineer in the New England territory in the Filtration Division.

Q Of what period are you speaking now, according to years. A For the period of approximately seven or seven and a half years from about 1942—well, to be exact from February 1, 1942, to June 1, 1949.

Q What was the nature of your duties as of
97 the period 1942? A I was a sales engineer.

Q For what? What type of equipment? A For filters.

Q To whom did you sell these filters? A To industrial plants using machine tools.

Q During the period 1942, or either before or subsequent, did you sell filters to machine companies, that is companies using metal working machines for clarification of their emulsion-type coolants? A Yes, sir.

Q And during what period was that? A Well, from about 1942 to approximately sometime in late 1944 or 1945.

Q What was the acceptance of the machine industry to your filters for the purposes of treating the dirty emulsion coolants? A Well, frankly, rather limited. In other words they were difficult to sell because of the limitations of the equipment.

Q Will you explain what you mean about limitations of equipment? A Well, we had primarily two types of filter applied to that field. One was the so-called vacuum type filter employing a pre-coated screen, and a
98 pressure type filter employing a pre-coated screen, and we also had another vacuum type filter without a pre-coated screen which was essentially a wire screen strainer drawing the dirty coolant through the screen, collecting the solids on the screen and discharging the clean effluent back to another tank for recirculation to the work.

Q You spoke of the limitations as being objectionable from the standpoint of the machine industry. Why? A Well, because of the amount of contamination in the coolant which would of necessity clog up your screen or your pre-coated medium depending on the volume of dirt in the coolant. That might plug up as often as, well, in an extreme case I can cite one example, it plugged the screen up in twenty minutes and the average cycles between cleaning the screen we will say was perhaps six or seven hours, necessitating the shutdown of the filtering system, cleaning of the screens, putting them back and restarting your operation.

Q Did that mean a shutdown of the metal working machine itself, too? A Not necessarily in all cases. If the job was a very fussy one, like precision grinding where they will grind to three or four micro-inch finish, where the slightest bit of contamination would be deleterious to the work, in an event like that they would have to shut down the system and cease grinding.
99 If it were a job where the finish wasn't so fine they would get along on a by-pass basis while they were cleaning the filter system. During that interval of perhaps half an hour to an hour that the filter was being cleaned they might operate with a dirty coolant during that period.

Q By a by-pass basis you mean they were recirculating the contaminated coolant back to the machine without any cleaning treatment whatever? A That is correct, which is a thing which of course naturally they wanted to get away from.

Q Have you any further comments with respect to your observations or experiences in connection with the company sales, that is the U. S. Hoffman Corporation sales of these filters for this particular purpose of clarifying coolants? A In what respect, sir? As to volume of business, you mean, or something of that sort?

Q Yes. A Well, I don't know if I can enlarge on that greatly except to say that there was a definite resistance to the sale of that type of equipment because of the extreme amount of service required on cleaing them and the interruption of service of the machine tool of the extreme amount of service required on cleaning

THE COURT: Did you have to sell an individual machine for the individual machine or could you
100 use machines in sequence, with reference to the filter?

THE WITNESS: We sold them both ways, both as individual machine applications and as so-called central systems. When we had a battery of machines we fed from a central tank; we call that a central system.

THE COURT: You mean machines all of the same character or could you use a grinder or milling machine and a drill press, so to speak.

THE WITNESS: Yes, that would be possible provided the coolant required on the work was the same in each case.

THE COURT: In other words, whether the coolant required on the work was the type of coolant that also could be used in the machine in question, having in mind the type of work which the machine was bought to perform?

THE WITNESS: That is right.

THE COURT: In other words, I have said the same thing you have said but it took me longer to say it.

THE WITNESS: That is right.

BY MR. PARRY:

Q When you speak of the buyer-resistance of the machine industry to your filter clarifying equipment, do you imply that they were not interested in clarifying their coolant? A Oh, no. They were definitely interested in it, as evidenced by the fact they were willing
to put up with the disadvantages of our equipment
101 as it existed at that time to get the result of a
clean coolant.

There has never been in my experience any lack of desire on the part of these users to have a clean coolant, they all want that, but they also want it with the least amount of effort and with the least amount of interruption to their service.

Q You have been speaking, I take it, of the period 1942 to 1944 to which my question was directed; am I correct? A That is correct.

Q Before you went with the Hoffman Company had you had any experience in selling filters? A Yes, with other companies.

Q With what company? A I was manufacturers' representative in selling the Bowser Filter, which is comparable equipment which we had to that of the Hoffman Company.

Q Did you sell Bowser Filters for the purpose of clarifying the emulsion coolants to machine manufacturers? A That is true.

Q And what was your experience during that period of your work? A Well, it was less satisfactory than that with the Hoffman Company.

Q Why? A Well, the line was less extensive
102 and they had had less experience in the field than
the Hoffman Company had, and less public acceptance, let us say.

Q Did you in fact sell filters for this particular purpose? A Yes, sir, many of them.

Q I am speaking now during the period prior to 1941 during your prior employment. A I sold a few prior to my Hoffman connection.

Q Do you have any knowledge of how they worked? Do you have any personal knowledge of how they worked? A Oh, yes; I know for I not only sold them but I had to see that they operated.

Q And will you explain how they did operate, based on your personal knowledge? A Well, we encountered usually two main difficulties in dealing with water-soluble emulsions. One was that in the grinding work particularly the volume of solids generated was pretty high in many instances on coarse grinding work particularly, and in the limited amount of filter area available in any moderate sized installation you didn't have sufficient filter area to accumulate the solids, with the result that you built up a coating of sludge on the filter screens, either

the pre-coated or plain screen type, so that very soon the openings were restricted and your flow would decrease to the point where you no longer got an adequate
103 supply of coolant to the work, at which point it would be necessary to stop the filter, scrape the accumulated sludge off the screens, in some instances to wash them, put them back in, and put the unit back in operation.

Q Did you during that time, when you were selling these filters, prior to 1940, find that there was an interest or disinterest among machine manufacturers for a clarifier? A Oh, a very definite interest, which has existed for many years, long before I got in the business.

Q During your experience, either prior to or subsequent to 1940, did you in the course of your work come into contact with any other type of clarifying equipment in the treatment of emulsion coolants? A Yes, a few installations that had been made by competitors, items such as the centrifuge and magnetic separators were also used for similar work. Then the Fafnir type settling tanks were all quite common installations which I had observation of.

Q Based on your own observation in these plants what can you say as to the operation of the centrifuge in clarifying these emulsion coolants? A Well, they are primarily limited to by-pass systems. By that I mean with a flow rate of any given flow rate, the centrifuge would only handle a portion of that. Usually about 10 or 15 percent of the total flow involved would go
104 through the centrifuge.

With your settling tank the usual procedure was to provide a settling tank with a minimum retention of about twenty minutes; that is to say if you had a flow rate of 100 gallons per minute you would have to have a tank big enough to hold that total amount that would flow in in twenty minutes, in order to give the solids time enough to settle out. Twenty minutes is about the average design for a straight line settling tank.

On your magnetic separators of course the limitations of those were the fact that they were primarily designed for removal of magnetic particles which could be attracted by a magnet, and your non-magnetic material, such as abrasive from your wheel and wheel bond, which might be rubber or other materials, synthetic, would not be taken out by the magnetic separator, nor would they in most instances. The clarification that you get from those would not approach even the standards that you might get from a pre-coated type filter, for example.

Q Did you in your travels during all this period find any manufacturer who apparently was getting satisfactory operation either with a filter or a centrifuge or any other type of clarifying equipment? A He might be getting satisfactory operation from the standpoint of clarity. We will have to differentiate there.
105 For example, a pre-coated type filter would give excellent clarity but the tension factor on it was so high and the cycles between cleanings so short as to make it a pretty impractical proposition as far as any widespread application was concerned.

Q Are you familiar with the flotation process and system of treating emulsion-type coolants involved in the two applications of these suits? A Yes, sir.

Q Will you explain very briefly your first contact with them? A Well, my first experience with it was in viewing the installation that was made at the Norma-Hoffman Company before U. S. Hoffman Company took it over.

Q Took over what? A Took over this flotation process. I had been trying for several years to interest them in equipment of the filter type over in their plant and—

Q (Interposing) This is Norma-Hoffman? A Norman-Hoffman, yes, sir, and I naturally heard, in the process of trying to sell them, that they had tried out a pilot unit—I knew that to be the case—and one day I

went in there and found that they had installed a central system with the Cyanamid flotation process, and I had an opportunity to see it in operation. That was
106 my first contact with the flotation unit.

Q What was your impression based on your observation as of that time? A Frankly I was very excited.

Q Why? A Because it was perfectly obvious to me that if we didn't get hold of it it would put us out of business as far as water-soluble emulsions were concerned.

Q You mean in the sale of filters? A Yes. I felt it would supersede the filter as a water-soluble emulsion clarifier.

Q As a result of this experience did you do anything about it? A Yes, sir. I immediately went up to American Cyanamid Company—first I asked Norma-Hoffman people who was the person over at Cyanamid who was handling the thing, and so forth, and got Dr. Booth's name and went on an exploratory call to see what might be done about it.

I told him I had seen the unit in operation and was very much impressed with it, and asked if there was a possibility whereby U. S. Hoffman Machinery Company might become a licensee of the process so that I could have the advantage of selling it in my territory.

Q Do you know whether as of the present time the U. S. Hoffman Company is the licensee under the
107 two applications involved in these suits? A Oh, yes, they are.

Q And when was that effected, do you know? A I think we consummated a working agreement with them, if I am not mistaken as to the dates, probably about in 1944. We started right out on a temporary working agreement, after first having gotten the cooperation of the Cyanamid people in loaning us a unit so that we could test it in the field for our own satisfaction.

Q Was this an exclusive license or a non-exclusive license? A I believe it is an exclusive license.

Q Did U. S. Hoffman Company in fact eventually build and sell commercial machines embodying these inventions? A Oh, many of them, yes, sir.

Q Beginning as of what period? A I think actually the first deliveries were made sometime around 1945 or 1946; 1945 I believe we made our first deliveries because I sold the first one myself.

Q Can you place the period in relation to the termination of the war? A Well, the first one went into Imperial Knife Company in Providence, and I am quite certain it was in 1945. However, I wouldn't be too sure about that without referring to the record.

108 Q Did you subsequently continue to sell the flotation type of equipment of these inventions for the treatment of emulsion coolants? A Yes, sir.

Q Made by Hoffman Company? A Yes, sir, sold a great many of them.

Q During what period? A Well, they are still selling them today. I sold them continuously right up to my retirement from the company last June.

Q That was June, 1949? A Yes, sir; the last one I sold was to the American Steel & Wire Company in New Haven.

Q When you went to sell these machines what was the initial reaction of the machine industry to it? A Well, they considered it extremely novel and were very much interested in it, but frankly they were decidedly skeptical. It seemed a little bit difficult for them to believe that the problem of constant cleaning of clarifying equipment was at an end.

Q Is it your experience, based upon the operation of these U. S. Hoffman machines embodying these inventions, that manufacturers are now satisfied, or are they now complaining that they still have a problem of clari-

fication of the coolants? A Oh, no, they are com-
109 pletely satisfied with it. The evidence of that is
obvious; I mean they reorder material.

Take for example in an organization like Ford Motor Company, who have tried out dozens and dozens of different types of clarifiers, I think it was perhaps three years ago that we sold them the first equipment and since then we have installed several dozen of these units in Ford Motor Company. The same is true of Plymouth, the Chrysler organization, and General Electric and many others of a similar nature.

* * * *

111 Q What is the price of equipment for this clarification as manufactured by the Hoffman Company for the machines? A Well, it varies from individual machine application up to large central systems; they might range from an individual machine application at approximately three, seven or eight hundred dollars up to central systems involving as much as eighty or ninety thousand dollars.

THE COURT: This so-called exhibit which will
112 be introduced tomorrow is one of a group of
Hoffman flotation units; that is an individual unit, is it?

THE WITNESS: No, sir, that particular one is a central system. That is one of three central systems that we have at the Fafnir Bearings Company in New Britain, Connecticut.

THE COURT: All right.

MR. PARRY: Direct examination closed.

Cross-Examination

BY MR. MOORE:

Q You made repeated references to a pre-coated filter as sold by you for Bowser and U. S. Hoffman Company? A Yes.

Q What in fact is the construction of a pre-coated filter? A Well, it is two screens separated by a coarse meshed third screen and on this screen is deposited a coating of diatomaceous earth, fossilized diatoms.

Q That material is found in California? A That is correct, yes, sir; it is a standard filter medium. It is actually about the consistency of, say, flour but it is extremely porous and of one-eighth inch thickness or about the equivalent of running a liquid through a ten-foot bank of filter sand. It does a very fine filtration job. It is usually used—well, if you want removal down to one micron in any dimension that will do it.

113 THE COURT: You say it is the consistency of flour?

THE WITNESS: Pretty close.

THE COURT: That is white milled flour?

THE WITNESS: Yes.

THE COURT: Fuller's earth?

THE WITNESS: Very similar, but unlike Fuller's earth it has no chemical affinity to the material in the coolant used.

BY MR. MOORE:

Q To what classes of companies or individuals did you sell these pre-coated filters? A To the same type of company; in fact in many cases the very same customer to whom we sold the flotation unit.

Q Machine shops? A Yes; I wouldn't call them machine shops; they are really manufacturers doing production work.

Filters very seldom could be sold to a small machine shop. They are usually manufacturers who have a multiplicity of machines turning out identical parts where they can set up a machine to make a certain part and that machine operates on that day after day.

Q You sold it to manufacturers for use in their manufacturing plants, is that true? A That is correct.

• • • •

126 *Dr. Robert Ben Booth,*

a witness called by the plaintiffs, being first duly sworn, was examined and testified as follows:

Direct Examination

BY MR. PARRY:

Q Please state your name, residence and occupation. A Robert Ben Booth; 61 Sterling Place, Springdale, Connecticut. I am employed by the American Cyanamid Company, Stamford, Connecticut, as a chemist in the Mineral Dressing Laboratory which was previously called the Ore Dressing Laboratory.

Q What is the nature of your duties in that capacity? A My work concerns the development of chemicals and processes for use in the field of froth flotation.

THE COURT: You are a chemical engineer or a chemist?

THE WITNESS: I am a chemist.

THE COURT: And what has been your professional training?

THE WITNESS: I hold a Bachelor of Arts degree,
Brown University; Master of Science degree,
127 Brown University; Ph. D. degree, Brown University.
The latter two degrees are in chemistry.

BY MR. PARRY:

Q What has been your experience in the field of froth flotation? A I have worked in this field for approximately 15 years, during which time I have had occasion to conduct test work on a large number of different types of ores and to apply froth flotation methods to the treatment of these ores. Also to apply froth flotation methods in allied industrial fields.

Q Such, for example, as what? A Well, coolant clarification and the like, wherein we have been attempting to clarify liquid media.

THE COURT: I might say, Mr. Parry, that we possibly could save time—and I don't know whether or not you have specifically in mind at the moment what I am about to say; in other words I thought if you were going to take Dr. Booth over Mr. Morash's testimony yesterday as to how they came upon this discovery that would be merely cumulative, because the main thing that I am concerned with now, and of course that you are concerned with, are the references that are cited against this.

MR. PARRY: I am only going to touch on it on one particular point, but what I wanted to do was to
128 qualify Dr. Booth as an expert in this field of froth flotation.

THE COURT: I will admit, and I assume Mr. Moore will concede, that Dr. Booth is an expert in his field.

MR. MOORE: That is conceded.

MR. PARRY: I am doing that because he is to testify in regard to these various references.

BY MR. PARRY:

Q Dr. Booth, concerning the development of this invention, I want to ask you, as I did Mr. Morash yesterday, when you took any of the materials in these jars containing these dirty coolants that had been received from some company, and you put a settling agent in them, and some solids appeared at the top and some at the bottom, and you and Mr. Morash decided to try froth flotation, what did you expect to get? A Based on my experience in the field of mineral dressing, or ore flotation, I expected some of the material would float and that some would remain in the flotation cell.

Q Did you expect to get all of the solids coming off at the top? A No.

Q Was that surprising to you? A Yes.

Q Do you state that on the basis of your experience as an expert in this field? A I do.

129 Q Was there anything else surprising to you about the result that you got? A Yes, there was.

We were working with an emulsion, and I had previously used the Fagergren flotation machine to break emulsions.

Q Of what type emulsions were those? A They were emulsions such as you get in the scouring of wool.

* * * *

Q Did you have any practical experience with these wool fat emulsions? A Yes. We devised a method for treating the emulsions and installed a plant to treat them at the Botany Worsted Company in Passaic, New Jersey.

Q When was that in relation to the development of your present invention? A I can't set the date exactly but it was before, definitely before, in time.

Q What does your experience with that, using
130 froth flotation for breaking emulsion, suggest to
you with respect to what would happen in this treating of coolants? I want the record to be entirely clear on that. A Well, I was quite concerned over the fact that there was a possibility that the froth flotation treatment would break the coolant emulsion; in other words split out some of the lubricating materials from that emulsion.

Q And did it? A No, it did not.

Q Did you follow this point up with respect to whether the treatment of froth flotation would break these oil-in-water coolant emulsions at any later date? A Yes, I did. In our preliminary work with Norma-Hoffman Bearings Company, when we were first testing their coolants in our laboratory machine, we asked them to determine the oil content of the coolants before and after our flotation treatment. They did this and they reported that there was no significant change in the oil content of the coolants before and after the flotation treatment.

We went further with this when we installed a pilot plant at Norma-Hoffman to test out the process further.

We had similar tests run and they confirmed the results obtained in the laboratory tests.

Q You mean to say that even at that late date you were a little fearful that the emulsion would be
131 broken by this froth flotation? A Yes, I was, and I went further with this.

When U. S. Hoffman installed a clarifying unit at the Imperial Knife Company, at Providence, Rhode Island, I actually took some apparatus up there with me. I was working with Mr. Bennett at the time, and I personally determined the oil content before and after flotation. There was no significant change in the samples that I tested.

Q In various of the claims of the applications here involved, Dr. Booth, the terms "continuously-operating," and "self-cleaning" appear in one way or another in regard to the process and system.

Will you explain to the Court just why you regard your process and system as self-cleaning? A In this respect. We cause the solids to float at the top and take them out of the clarifier proper, in contrast to other clarification means on the market at the time we were marketing this invention. By so doing we allow the body of the coolant, or the bulk of the coolant, to go back in a clarified state for useful work and reuse.

THE COURT: I would like to ask you this question, if I may. Have you got the Broadbridge patent there in your hand?

THE WITNESS: Yes, I have.

THE COURT: Do you find in line 28:

> "According to this invention the process for the
> 132 separation and recovery of the constituents of an emulsion comprises submitting the emulsion to agitation and to the action of a gas in the form of minute bubbles, under such condition that there are formed therein a multitude of the minute bubbles char-

acteristic of the froth-flotation separation process, in order that certain constituents of the mixture, by preferential attachment of the gaseous bubbles, may be carried to the surface in the form of a froth and removed."

And then he says:

"Preferably, this is effected by submitting the emulsion to agitation and aeration with air or other suitable gas as is employed in the well known froth flotation process of ore concentration."

Wouldn't that seem to one skilled in the art, as you are, and faced with the particular and practical problem that you were faced with with respect to coolants, wouldn't that possibly lead you to the conclusion that, familiar as you would be with the Broadbridge patent, the same result might as a consequence follow if you applied this herein expressed theory to your particular problem?

In other words, I gather—I may be completely wrong about this—but I gathered yesterday that one of the main, if not the main, characteristic of this whole 133 process was the formation of gaseous bubbles and the attachment to those bubbles of the product that is subsequently, as a result of that attachment, brought to the top and can be either scraped off or by the use of the apparatus here involved be rotated off.

My question is, and this the question I ought to address myself to, and I am asking you in advance: Suppose I was skilled in the art that you are skilled in, as a chemist, and I have this particular problem presented to me, namely, how could I recover free from contamination a coolant that once had been used, query: Would I, if I read this Broadbridge patent, be given a clue or a lead to the possible solution of my problem?

THE WITNESS: I think I can answer it.

THE COURT: That is the problem I have to decide.

THE WITNESS: At the temperature that these wool-scouring liquids are treated we have a totally different system in a sense than we have in coolant clarification, because here we have a liquid-liquid system. I mean the wool fat is present in the form of a liquid and not as a solid. And I definitely would, in view of the teachings of the patent, expect the coolant to be broken and therefore not useful particularly in view of line 87:

> "The invention has been found specially advantageous in the treatment of certain obstinate emulsions, the
> 134 constituents of which have presented great difficulty of separation."

Here we are taking a liquid from a liquid.

BY MR. PARRY:

Q Am I correct, Dr. Booth, that this Broadbridge patent, in view of what you have just stated about the wool fat being a liquid, is concerned with breaking an emulsion, separating liquid from liquid out of an emulsion, is that correct? A Yes.

Q There are no solids involved in it, as I understand it. A The recovery of the wool fat is primarily concerned with taking the liquid-fat constituent out of the wash solution.

Q I am speaking as of the time the froth flotation treatment is effected, that is under your high temperature conditions, which according to page 2 of the patent, lines, 38 and 39, is at a temperature range of 25 to 30 degrees Centigrade. A That is right.

THE COURT: I take it also, by virtue of what you said subsequently in answer to questions proposed by counsel, that you make the distinction that the froth flotation used in this process is the same as the inventor says, "is the well known froth flotation process of ore concentration"?

135 THE WITNESS: Yes, sir.

THE COURT: In other words, you make the same distinction that Mr. Morash made yesterday, that in the particular problem which you have in recovering ore which has a salable value, the water could not be recovered in the ordinary process, that is the separation of solids from solids?

THE WITNESS: That is right.

THE COURT: In other words, he described it yesterday as the separation of quartz or silica from the sand—

THE WITNESS: Beg pardon—phosphate rock.

THE COURT: Phosphate rock, and you stated it directly.

THE WITNESS: That is right.

THE COURT: He was talking about phosphate rock and sand, solid from solid.

THE WITNESS: That is right.

THE COURT: All right.

BY MR. PARRY:

Q One other question at this point, Dr. Booth. In your application involved in Civil Action No. 1887-48, on page 6, the middle of the page, appears the statement:

"It is also an advantage of the present invention that it is not limited to any particular type of flotation apparatus."

And again on page 7, the first full paragraph, 136 the opening sentence says:

"However, other known types of flotation cells, whether of a mechanical type, a pneumatic type or an apparatus employing a combination of both may be used effectively."

Will you explain for the Court what that means?

137 A In the field of froth flotation there are three general types of flotation machines: The mechanical; the pneumatic; and combinations of the mechanical and pneumatic.

The mechanical machine introduces its air by mechanical action. The pneumatic machine is usually thought of as introducing air by direct means. In other words, you blow the air into the ore pulp. And then of course the combination of the two methods will be obvious.

Q I now hand you a copy of the Booth and Morash patent No. 2,436,375, which is Defendant's Exhibit B in Civil Action No. 1887-48. That patent is relied upon in defense on grounds that Claims 39 and 40 of such application involve the same invention as Claim 7 of this patent. This claim is a rather long claim, and to save time I will quote the last clause of this claim to read it into the record, and then hand the patent to you, a process claim, and the last operation is:

"* * * continuously removing decontaminated coolant from said second zone; and removing settled particles from said first zone without substantially altering the fluid flow conditions therein."

I will ask you if you will take the patent and explain what that refers to in the patent. A Well, if we turn to Figure 3 we see on the edge here (indicating) and going up here (indicating) a drag type
138 scraper, so to speak.

THE COURT: Doctor, you will have to help me, because when you say "on the edge here and going up there," I look over there and see what you are pointing at; identify it by numeral and it will be simpler for me.

THE WITNESS: If we start with 47 and go around to 50 and come down to 51, then 52, and go up on the diagonal again to approximately at 47 we have a drag scraper which is removing the dirt from the apparatus.

BY MR. PARRY:

Q What is that scraper working in? Is that in the froth flotation chamber? A In this case I don't think it is.

THE COURT: What is that working on, a ratchet?

THE WITNESS: That is working on material that has—

THE COURT (interposing): I don't mean the material it is working on; I mean how is it working mechanically?

THE WITNESS: It is working by an electrically driven motor.

THE COURT: 52 and 51, what are those, wheels?

THE WITNESS: I would say gears.

THE COURT: I call them a ratchet; you mean gears or a sprocket?

THE WITNESS: That is right, a sprocket that drives the chains that in turn drives this (indicating); I call it a drag.

139 BY MR. PARRY:

Q What is this (indicating)? Is that a settling tank or is that the froth flotation chamber, looking in that connection at Figure 2 in connection with Figure 3? A No, it is apart from the froth flotation machine.

Q Is that a preliminary settling operation for taking out coarse solids before you go to the froth flotation machine? A This diagram is a little complicated; I would like to have time to consider it.

Q I call your attention to column 7 of the patent specification near the top of the page. A You mean the first paragraph there?

Q Yes. A Yes, that is settling.

Q I call attention to the paragraph beginning at the bottom of column 8 and continuing at the top of column 9.

THE COURT: For the record that begins, "The operation of the clarifying unit?"

MR. PARRY: Yes, Your Honor, "The operation of the clarifying unit."

A Yes, I have that paragraph:

"Thus, only these larger particles are removed by settling. The settled particles may be removed in any desired manner, either by hand or by employing one of the modifications in which provision is made for automatic removal." 140

BY MR. PARRY:

Q Does that enable you to answer my question, which was to the effect of whether this traveling belt arrangement, which is shown in Fig. 3 as removing solids, is working in a settling chamber or in a clarifying chamber or working in the froth flotation chamber? A It is removing settled solids.

Q From what type of chamber? A From the settling tank.

THE COURT: Now, on diagram Figure 3 the settling tank is which? Is the settling tank depicted there? I assumed it was.

MR. PARRY: Your Honor, I suggest that if you look at Figure 2 in connection with Figure 3 you will get the picture clearly.

You will notice that in Fig. 3 you see the clarifying chamber shown right in the front in full view and that this traveling belt arrangement taking out dirt is shown in phantom lines to the rear, and if you look at Fig. 3 you will see that belt is working in a chamber which is at the top of Fig. 2 and is a different chamber from that in which the clarifier is, as shown in both Figs. 2 and 3.

THE COURT: I am still confused; you had better come and show me what you mean.

141 (Thereupon, counsel approached the bench and conferred with the Court.)

BY MR. PARRY:

Q Getting back to claim 7, the clause which I quoted, as I understand it refers to the operation of this conveyor which is taking dirt out of this settling chamber? A Yes, sir.

Q The clause referred to: "and removing settled particles from said first zone without substantially altering the fluid flow conditions therein." That is in the settling chamber? A Right.

Q I have asked you to read over your application involved in Civil Action No. 1887-48. Is there anything in that application or in the drawings which show that operation as described in that claim? A No.

Q I call your attention to the fact that in Fig. 3 of the drawing of the application in Civil Action No. 1887-48 there is shown at the right-hand side diagrammatically a tank which is described as settling, and there is a showing that settled solids are removed from that. A Yes.

Q Is there any showing there of a continuous
142 removal or is there any statement in your application involving a continuous removal? A No.

Q Am I correct then that there is no disclosure of the step of the last clause of Claim 7 of Patent No. 2,436,375 in your application involved in Civil Action No. 1887-48? A That is correct.

Q I now hand you three patents constituting Defendant's Exhibits I, E and H, these being the patents to Sulman, Callow and Munro. Will you describe to me very generally what the nature of the operations involved in those patents is? A The three patents have one common aim, namely, the treatment of ores to selectively remove one mineral constituent.

Q Are they all directed to removing mineral solids from mineral solids by froth flotation? A Yes.

Q Do they all involve selective separation of solid from solid? A Selective and specific separation of solid from solid.

Q I ask you to look particularly at the Callow patent, Defendant's Exhibit E, and will ask you the nature of the aerating means employed therein. Is that
143 similar to a Fagergren mechanical agitation unit
with supplemental air injection or is it not? A The Callow type apparatus is a pneumatic type apparatus as distinguished from the Fagergren type which is a mechanical aerated.

Q Is the pneumatic type of apparatus which is there shown, as applied to mineral flotation, adapted for use in your application for the treatment of these emulsions in line with the statement in your application, to which reference was made a short time ago? A Yes, it is.

Q I now hand you a copy of Defendant's Exhibit C, the Breerwood patent, and will ask you to what it is directed. A The Breerwood patent is directed to the beneficiation of cement rock.

Q I direct your attention particularly to Fig. 1 and call your attention to the fact that a flotation operation is indicated in the lower portion of the diagrammatic support there. Can you tell from looking at that, and from the rest of the patent, the nature of the froth flotation operation there involved? A Yes. The froth flotation operation involved here is removing a specific mineral constituent from another. It is doing this selectively.

144 You will note that siliceous matter is coming out of the flotation machine and is complete as a reject and moving to waste.

Q Is any other solid coming off at a different point? A Yes, there is another flotation concentrate coming off and going to a thickener and then to a blending device.

Q Is that generally analogous to the operation of froth flotation in the mineral recovery field? A Yes, it is.

Q I now hand you a copy of Defendant's Exhibit A, Booth Patent No. 2,153,449. Are you the inventor named in that patent? A I am.

Q Will you explain the nature of the operation there involved with respect to the froth flotation? A This invention involves the use of froth flotation for removing sulphur from rayon-spinning baths. These baths are chemical baths into which the viscose is extruded and by the action of the bath sulphur is liberated which tends to foul the bath and foul the rayon spinerets.

Q In what form is the sulphur liberated? A The sulphur is liberated in the form of elemental sulphur, in fine colloidal form.

Q Do you mean that the sulphur is evolved in the bath itself as a result of chemical action? A Yes.

The action of the bath is to decompose the 145 viscose, regenerate the cellulose in the form of rayon. The action is a chemical reaction.

Q What causes the liberation of this sulphur? A The viscose is a sulphur-containing compound, and when it is brought in contact with the spinning bath which contains sulphuric acid the viscose is decomposed, the sulphur content of the viscose is liberated as hydrogen sulphide.

• • • •

146 Q Now, I ask you with respect to the first patent, namely, Defendant's Exhibit A, which is Exhibit A in both cases, this rayon spin bath patent, what relationship if any, or what parallel if any, there is between that bath and the clarification of coolants involved in the present action? A There isn't any. The materials we are working with are totally different. The functions of the two liquid media are totally different. One is used in a chemical reaction and in the case of the coolant the action is physical. It is used to cool and to lubricate, not to react chemically.

Q Could you in your capacity as an expert in the field of froth flotation predict from a reading of this patent, and your knowledge, as the inventor of such patent, what would happen if froth flotation were applied to the treatment of these emulsion coolants here involved? A No, I could not. The problem in the rayon spin bath is the removal of sulphur.

Q And where does that sulphur originate? A From the viscose which is put into the bath and by reaction of the acid bath on the viscose.

THE COURT: Don't you say however here,—I am now referring to Patent No. 2,274,658, line 47, column 1:

"I have found that a froth flotation not only separates floatable solid constituents in the form 147 of a concentrate but also performs the additional function of setting free in gaseous form a large proportion of dissolved gas or volatile constituents of the suspension."

My question is directed to the fact that apart from the purpose specifically of this invention, query, whether or not you haven't said here that you have found that froth flotation not only separates floatable solid constituents by way of concentration but by way of inference you indicate that froth flotation would separate floatable constituents of any character, and by virtue of the action of the gassy bubbles bring that content to the top?

THE WITNESS: I believe I can answer that question.

As we have just pointed out we liberate sulphur in these baths.

THE COURT: That is a chemical reaction, isn't it?

THE WITNESS: Yes, sir. That sulphur mineralogically and floatatively is very easy to float. It is a single constituent as contrasted to the multiplicity of constituents in the coolant solution.

THE COURT: But suppose there were constituents in this solution that you are dealing with here, in which this chemical which has taken place would have those drawn to the top, so to speak, and the debris floating on the top of the solution?

148 THE WITNESS: In view of the composition of the rayon spin bath, I would not expect the components of the coolant solution, if present in the spin bath, to come to the top by froth flotation.

THE COURT: If there were contaminants in that solution what would happen to them in the course of this chemical change?

You say that the viscose resolves itself into sulphur—the action of the hydrochloric acid on the viscose liberates sulphur, correct?

THE WITNESS: Yes.

THE COURT: What you call it I don't know, but what would happen to a contaminant that was in that solution?

THE WITNESS: You mean other than sulphur, sir?

THE COURT: In other words, suppose there was something in the nature of minute debris, despite all effort to keep it out—

THE WITNESS (interposing): You mean things like sand?

THE COURT: That's right—what would happen to them?

THE WITNESS: I don't think it would float.

THE COURT: What would happen—go down to the bottom?

THE WITNESS: Yes.

THE COURT: All right.

BY MR. PARRY:

Q Is that statement based upon your actual experience in observation of the operation of a rayon spin bath clarification according to the patent? A Yes. 149

Q Has there been a commercial installation of a rayon spin bath clarification according to the patent? A There are several in the United States and there are also several in various countries abroad.

Q Where are there any in the United States? A There is an installation at the New Bedford Rayon Company, in New Bedford, Massachusetts; the Delaware Rayon Company at New Castle, Delaware; and in certain plants of the American Viscose Company—I can't place them geographically.

Q Have you observed any one or more of those plants in actual operation? A Yes, I have. I installed some of them.

Q And what were they taking off from their rayon spin bath there? A Colloidal sulphur and degasifying the bath.

Q I call your attention to the paragraph on page 3 of the second Booth Patent No. 2,274,658, Exhibit B in the second case, which was read into the record yesterday by the attorney for the defendant. Have you read that statement? A I have.

Q I also refer you in that connection to the statement appearing in the first paragraph at the top 150 of page 4. The latter statement is to the effect that this invention is useful in the removal of solids and obnoxious gases from rayon spin baths and other cellulose settling baths.

The statement which was quoted into the record seems to be a much broader statement to perhaps imply that the process of froth flotation can be used in other fields.

Can you on the basis of your knowledge of these two patents, and the operation of rayon spin baths, explain whether that statement is indicative that you can use froth flotation for treating coolants such as here involved? A No, I don't think it is applicable for the reasons that I have given.

• • • •

Q Dr. Booth, is there any relation in composition between a rayon spin bath and an oil-in-water coolant emulsion? A No, there isn't, and particularly in regard to froth flotation these things are totally different.

Q Why? A Well, in any ore flotation problem, whether it is the separation of minerals or a clarification problem, or what you will, it is very difficult to predict what will happen until you have actually tested 151 the material. I would like to go into that a little further.

Back in the laboratory we have ores coming in from all over the world. Lots of times those ores contain similar constituents, I mean chemically similar, and yet a constituent chemically similar in Ore No. 1 behaves quite differently flotation-wise from the same chemically similar constituent in Ore No. 2.

We put men to work on them to find out why, how we can overcome these difficulties and therefore recover the mineral constituents.

The same is true in other types of problems involving the use of flotation.

Q What do you employ in that line of endeavor, I mean to endeavor to float these minerals that you refer to? A We employ a laboratory cell of the Fagergren type. We also have other flotation cells.

Q Do you employ any reagents? A And we employ chemicals to make the materials float.

Q Do similar chemicals make different type of minerals float? A Within general limitations, yes, but we try to pick out a chemical specifically for each ore so that it will do the best job.

Q How about ores No. 1 and No. 2, to which
152 you just referred? A It might well be that a
chemical or a reagent that worked well on Ore No. 1 would not work anywhere near as well on Ore No. 2, and that Ore No. 2 would require a different chemical to achieve good recovery. Let me go a little bit further there. In our application we have mines with minerals that are in close proximity to each other and yet they are of a totally different chemical setup; they use totally different chemicals.

Q Chemicals for what purpose? For flotation agents or settling agents, or what? A For flotation agents and quite probably as settling agents also.

Q I come back then to an earlier question which I am not sure now whether I got a clear answer to it, and that was on the basis of your experience as an expert in the froth flotation work, with a wide variety of materials, whether it would be predictable from the Booth patent of Defendant's Exhibit A on the rayon spin bath that you could recover at the top all of the different contaminants of an oil-in-water emulsion coolant? A No, it would not.

Q I now hand you copies of the two Karlstrom patents, Defendant's Exhibits F and G in Civil Action No. 1887-48. Are you familiar therewith? A Yes, I am.

153 Q Can you state briefly whether those are froth flotation systems or not? A I look upon these two patents as covering processes which are different than froth flotation.

Q What fields are they in? A They deal with the recovery of paper fibers from paper mill wastes.

Q What is the nature of those wastes? A Those wastes are suspensions of cellulose in relatively large volumes of water.

THE COURT: Dr. Booth, basically, I take it, unless I have completely missed the point, that your process claim, as distinguished from the application of froth flotation in other fields by the aid or assistance of a chemical reagent, that the claims here relate to agitation plus air, the separation of a solid from a liquid.

THE WITNESS: Yes, sir.

THE COURT: Isn't that it basically?

THE WITNESS: Yes.

MR. HARMON: Would you mind stating the question again? We didn't hear it.

THE COURT: What I am trying to say is this: That in the other fields, where you have separation of solid from solid, you have the application of a chemical
reagent, you have the application of these other
154 methods of apparatus, but basically what you have
involved in these claims, which separates them in
character and in genesis and in genus, so to speak, from those that I have alluded to, is basically separation of a solid from a liquid by agitation of the character you have indicated plus the application of air.

THE WITNESS: Yes, that is true, and I believe that was pointed out by Mr. Parry at the opening of the session.

BY MR. PARRY:

Q Dr. Booth, just to clear up a point, am I correct that the principle of froth flotation is agitation and air bubbles? A Yes.

THE COURT: The contention of the Patent Office here is, I understand from Mr. Moore's opening statement, that your technique is old; that froth location is old; correct?

MR. MOORE: Correct.

THE COURT: And that therefore anybody faced with the problem that you were faced with, this clarification of coolants for use in the type of machinery we have here discussed, would naturally, if they chanced upon or they read or they were familiar with, as you are presumed to be familiar with, what has been going on in your particular field, they would naturally try that experiment out and you would become instead of an inventor a mere plagiarist. In other words, you have discovered nothing new. You have taken an old tech-
155 nique and by virtue of experiment you have come
out with a novel result that probably others have overlooked, but the question arises, which is the question that I must solve, whether or not the application of froth flotation in the manner in which you have applied it here is in fact invention, before you would be entitled to be granted a patent. You made distinctions between these patents that have been cited against your application. My question basically is, and that you have answered, that what you do, you do by means of agitation plus the application of air, and where you are trying to separate out sulphur, or you are trying to recover phosphates or other matters that involve chemical action, or physical action stimulated by a reagent, you use a reagent.

The process is new in that the froth flotation causes all the mixed solids to come off the top, and that is an operating step of the process.

THE COURT: But if you say process and method are the same, both are synonymous, and therefore one can be substituted for the other, and the process or the method is froth flotation and the only difference between the process and the method is this froth flotation and in other froth flotations is the result, query: What distinction in substance have you?

MR. PARRY: Not to draw an overly fine distinction, Your Honor, because I think it is very fundamental, I say froth flotation is a technique which has been used in various fields.

In the mineral field it gives separation of solid from solid, some solid going off at the top and some at the bottom. That is a process involving froth flotation.

Operating steps of that process, which you have I
think identified as results, are that the solids sepa-
159 rate. You get a selective separation of solids but
those are operational steps; some go off at the top
and some go off at the bottom.

THE COURT: What is the process? That is what I am trying to determine.

MR. PARRY: The process is the action which goes on. Now, as applied to our system we apply agitation and aeration. As a result of that all of the solids are lifted to the top and they are recovered at the top, and our process claims, and our system claims, both emphasize, that substantially all of the solids are recovered at the top. That is an operational step.

I think that we have the same idea in mind, Your Honor, when you talk in terms of results, yes.

THE COURT: When you say to me that we are talking in terms of results, froth flotation to me is also a process because there are operational steps involved.

Froth Flotation in itself is not a result; it is a process. My question is, aren't you using the same process here but getting a different result?

I don't want you to agree with me for a moment now, please, but I want to have it clarified in my own mind.

I say from lack of familiarity with the term except
as it has been brought out here, that it would seem to
me, using words to convey our meaning, that froth location in itself is a method or process to arrive at
160 a result, and by the application of froth flotation
we see in the mining field and in the operational
steps that that implies you arrive at a named result,
namely, the separation of solid from solid. The hurdle
I have to jump is this: If you use froth flotation in this
particular field with reference to coolants you arrive at
a different result. Isn't that the point?

MR. PARRY: I am sorry, but I cannot accept that as complete because I don't think it is accurate patent-wise. Let me explain it this way. If we separate solid from solid I say that is one process—

THE COURT: How would you denominate that?

MR. PARRY: If we are separating a liquid from a liquid that is a different process. If we are separating mixed solids together from a liquid I say that is a different process, speaking patent-wise now, Your Honor.

Now, the technique involved in all of them may be froth flotation. The operation of agitation aeration is the same motivating force employed, but what goes in that flotation cell, where the solids go, is different and that is why I say I think we have different processes patent-wise. It is the result we are after, namely, to get all these solids off the top that makes this thing very important.

THE COURT: Your point is this, that while you apply froth flotation in A and in B and in C, you have

consituently in A, by the application of froth flota-
161 tion, a different process going on than you would
have constituently in B by the application of froth
flotation.

MR. PARRY: That is exactly it.

THE COURT: And C by the application of froth flotation and therefore conceivably a different result in all three cases.

MR. PARRY: We do get different results but I mean there is a different operation going on in that cell.

THE COURT: Very well.

MR. HARMON: In the Patent Office there are three separate classifications: Separation of solids from liquid; solids from solids; and liquids from liquids, and so forth.

THE COURT: Under the general category of froth flotation?

MR. HARMON: Yes, and the applications are classified and examined under that category.

THE COURT: That is important because otherwise I might go off on a tangent.

MR. HARMON: And we contend we have a new method of separating solids from liquids.

BY MR. PARRY:

Q You were discussing the Karlstrom patents. I think you said you did not regard those as froth flotation propositions. Will you explain why? A These
patents are concerned with the removal of paper
162 fiber from water, and that is not froth flotation
in the sense that we use it. Air is introduced but
before the air is introduced the solids are flocculated by means of chemicals.

Q What do you mean by "flocculation"? A Caused to grow together, the particles to sort of coalesce and come together, and then the air is merely put in to levitate those flocs and bring them up to the top.

THE COURT: Do you spell that word f-l-o-c-c-u-l-a-t-i-o-n?

THE WITNESS: Yes.

BY MR. PARRY:

Q Is this a rapid action and is there any froth formed at the top? A No, the paper fiber comes off with a consistency of, oh, sort of a heavy cream; and there is another very definite distinction between this type of solids removal and froth flotation in that the paper fibers will not come up unless they are in a very quiescent zone. Those flocs do not rise unless the zone is quiet.

Q Is that carried out in an open chamber or a closed chamber at the surface of the liquid? A These patents indicate that it is in a closed chamber, according to the drawings.

Q Do you recall whether there is any vacuum employed at all? A Yes, vacuum may be employed.

163 Q I refer you particularly to the second Karlstrom patent No. 2,248,177, Fig. 1, and to the rotor 8 which seems to have a series of blades 14 on it. Do you recall whether those are agitating blades?

THE COURT: Wait a minute until I find it. I assume those are the blades but I don't see 14 on them.

MR. PARRY: The numeral 14 is to the right.

THE COURT: I see it.

BY MR. PARRY:

Q Are 14 agitating elements? A Yes, they give gentle stirring to the liquid.

Q Do they rotate rapidly? A No; if they did the paper fiber wouldn't come up.

Q Why? A Because it would be swirled around and wouldn't rise to the surface. That is what happens in an ordinary froth flotation machine, the paper fiber does not come up. You have to have a quiescent zone to allow the flocs to come to the surface.

MR. PARRY: To save time I would like to read into the record this statement which appears in the first column on page 2 of this patent, beginning line 39:

"The shaft with the arms, which if desired may have different lengths, forms an agitator which with the suction nozzle rotates slowly (for instance one
164 or two revolutions per minute)."

What rotation speed do you use in your Fagergren machine and in all your operations with the clarification of these emulsions? A All the speeds are much higher than one to two revolutions a minute. In fact in the demonstration yesterday we used a speed of 2,200 to 2,600 r. p. m.'s. The speeds are lower than that in our commercial installations, but they are probably in the neighborhood of 350 r. p. m.'s up.

Q I now hand you the Brown patent, Defendant's Exhibit D in Civil Action No. 1887-48, and ask you whether you are familiar therewith? A I am.

Q What is the nature of that operation? A The Brown patents cover the apparatus consisting of a grinding wheel, circulation system for supplying grinding fluid, and means of conducting that fluid, and then a centrifuge for separating out the solid particles from the fluid.

THE COURT: Where is the centrifuge in Figure 2? Is it Figure 1?

MR. PARRY: You will find it, Your Honor, identified in Figure 1 by the reference numeral 1. It is shown encased and you will find a corresponding section of it in Fig. 2 with identifying numerals 21, and so forth. It is that vertical unit there.

165 THE COURT: I see, below 27, isn't it, and above 22?

MR. PARRY: That is right.

THE COURT: I have it. Thank you.

MR. PARRY: For the record, Your Honor, I will refer you also to the description on page 2 of the patent, first column, beginning in line 32 which identifies the various parts beginning:

"The pump shaft and bowl may be splined together to prevent relative rotation."

THE COURT: All right.

MR. PARRY: That is the description of the centrifuge.

BY MR. PARRY:

Q Dr. Booth, I call your particular attention to this portion of the specification which we are just referring to; I am reading beginning with line 35, the statement here which says:

"* * * the fluid to be clarified first passing into an inner chamber 24 having radial partitions 25 forming sediment pockets into which the heavier and more easily separated particles are thrown."

I will ask you to look at the patent drawing and advise me whether there is any means shown for discharging solids from those fluids. A No.

Q Would it be necessary to open up the centri-
166 fuge to clean it? A Yes, it would.

Q Would that system therefore be continuously operative? A No; the centrifuge itself would have to be shut down periodically for cleaning and this would probably entail stoppage of the grinding operation too.

* * * *

168 *Cross-Examination*

BY MR. MOORE:

Q Dr. Booth, since on or about 1937 you have been involved with the general problem of the clarification of liquid media, isn't that true? A I have been doing work in that field; it has not been the major portion of my work.

Q You have worked in that field since 1937,
169 on or about? A That is right.

Q Your first work was directed to the clarification of rayon spin baths, isn't that true? A Yes, sir.

Q How long did that work continue? A As I recall that work started in about 1936 or 1937 and went forward, preliminary laboratory work, pilot plant work, and installation for probably three or four years.

Q Then working in this same general field, the clarification of liquid media, you extended your effort to the clarification of lubricating coolants, isn't that true? A The work on lubricating coolants came sometime after the rayon work, and there was a sort of hiatus between the two when I was not pursuing liquid clarification effectively. Most of my work is concerned with mineral dressing.

Q On or about 1941 you entered into the field of the clarification of lubricating coolants? A That is true.

Q That was an extension of this same general development work in the clarification of liquid media, am I right? A Yes.

Q In the clarification of rayon spin baths you have resorted to a froth flotation process step? A Yes.

170 Q In the clarification of lubricant coolants you resorted again to the use of a froth flotation process step? A Yes.

Q Now, when you secured the contaminated lubricating coolant—was it in 1941? A Yes.

Q When you secured that coolant you thought of treating it by a froth flotation process step? A The problem as presented to me was presented in this way. I was requested to find a settling agent which could be added to the oil to make the materials, the dirt, settle to the bottom. In our laboratory we do work on both settling agents and froth flotation and flotation reagents.

We did the work on the settling first and the flotation work came later.

Q The fact of the matter is that settling agents and froth flotation agents may be one and the same in the case of certain compounds, is that true? A Yes, but not generally so.

Q In resorting to this froth flotation process for the purpose of clarifying this contaminated lubricating coolant you expected, didn't you, to get some floating of the particles in the contaminated lubricating coolant? A Would you clarify your question just a little? You mean when we subjected it to froth flotation we
171 expected some to float?

Q You expected something to float. A Is that your question?

Q Yes. A We expected something to float after we had run the settling test and had observed that a certain portion did float.

Q You referred to the Broadbridge patent, which is No. 1,505,944. That patent is assigned, is it not, to the Minerals Separation, Limited, of London, England? A Yes, sir.

Q That is an outstanding organization in the ore dressing field, isn't it? A It was, sir.

Q Is it out of business now? A It is not out of business but it is not as active as it was some years ago.

Q Active pioneer work was done by that organization? A Yes, sir.

Q Let me call your attention to page 1, first column, line 15. Don't Broadbridge and Edser in that patent say that, "The expression emulsion is used to connote emulsions or suspensions"? A Yes, they do.

Q In their patent they are using the word emul-
172 sion in a broader sense than it ordinarily has,
isn't that true? A In view of the fact that the wool grease is a liquid I don't think you can consider this as a suspension of solids in liquids.

Q Do you disagree with Broadbridge and Edser when they say in the same patent, the second column, page 1, line 98, that the values they are recovering are particles of wool fat? A They still may be particles, sir, but they might be liquid particles.

Q They are just grease particles, wouldn't you say, from this language here? A Yes, I would.

Q On page 2, the second column, at line 76, don't those patentees, Broadbridge and Edser, refer to their operation as being continuous? A The operation may be continuous.

Q And they say the same thing over on page 3, the first column, beginning at line 18, right? A Yes, sir.

Q You have indicated some familiarity with the claims; let's turn to the Claim 1 of this patent, which is on page 3. It calls for:

"The process of separating the constituents of an emul-
sion which consists in agitating and aerating the
173 emulsion under such conditions that there are
formed therein a multitude of the minute bubbles
characteristic of the froth flotation separation process so as to form a froth preferentially carrying one constituent of the emulsion, and separating the froth."

In view of the broad interpretation of the definition to emulsion, Broadbridge and Edser there are defining the process of removing suspended particles from a liquid; isn't that true? A Broadbridge and Edser, sir, are defining a process for removing liquid particles from other constituents of the emulsion.

Q A suspension is suspended particles, isn't that true? A A suspension, as I would define it, usually refers to solid materials in a liquid.

Q Suspended solid particles in the liquid? A Suspended solid particles in a liquid.

Q So if you give the term emulsion the broad meaning that Broadbridge and Edser give it here in that patent, you are having a claimed separation of solid particles from a liquid? A Not solid particles.

Q I am saying giving the term emulsion the broad
interpretation that Broadbridge and Edser give it,
174 you get a separation of solid particles. A I don't
give it the broad interpretation that Broadbridge
and Edser do.

A wool fat emulsion, as I understand it and I have worked with them, is definitely an emulsion in which the particles of wool fat are liquid and are of small size, definitely not solid.

Q In this process of yours and Mr. Morash, you get a continuous, self-cleaning operation because you are depending upon the flotation cell, isn't that true? A Yes.

Q It is the result of using the flotation cell; the cell itself is self-cleaning? A That is right.

Q There can be chemical aeration to promote froth flotation, can there not? A There could be in an ore pulp. I don't think there could be in a coolant because the addition of the chemical would render the coolant useless. It would definitely break the emulsion and separate out the lubricating constituents.

Q But in the broad field you get this chemical aeration as well as the physical aeration, you get by the
Fagergren cell, the Callow cell, and so forth theo-
175 retically in the broad field? A Do you mean that
by the introduction of chemicals you get aeration?

Q Yes, chemical aeration. A Could you just be a little more specific? I mean what would you add to get that? I just don't understand the nature of these chemicals.

Q You could have a chemical that would give off gas upon the application of say an acid? A Yes. That technique is used in ore flotation. If you added acid to a coolant you would wreck it.

Q I am suggesting that there can be chemical aeration in addition to the other methods of aeration that you mentioned. A In an ore pulp, yes; in a coolant process I would say no.

Q I could remove settled particles from a settling chamber without substantially altering the fluid froth conditions therein by using a long handled shovel, couldn't I? A Hardly, sir. If you brought that shovel full of dirt to the top it would contaminate the liquid and those contaminants would be borne back through the operation and would definitely be detrimental to it.

Q Then what do you mean in column 9 of your Patent No. 2,436,375 when you said at lines 5 to 8 that:

"The settled particles may be removed in any
176 desired manner, either by hand or by employing
one of the modifications in which provision is
made for automatic removal?" A Well, the use of hand removal doesn't necessarily imply the use of a shovel. Let me be a little more specific.

We have been using quietly running drag separators. I know where there is one such drag separator in operation. It is simply a blade which is taken through the solution very quietly. I think you will distinguish between that and a shovel, certainly.

Q You and I could put our hand down there through the settled particles very carefully, couldn't we? A If we were quiet we possibly could.

Q And that would be removing settled particles from a settling chamber without substantially altering the fluid froth conditions therein, wouldn't it? A I think it would. That would hardly be a practical method of doing the job.

Q But it could be done? The answer is yes? A Yes.

Q Let's look at your Patent No. 2,153,449, and let's refer to Claim 1. That claim calls for, does it not:

"A method of clarifying fouled regenerating baths from the regeneration of hydrated cellulose from viscose
which bath contains sulphur deposited out of solu-
177 tion, which comprises subjecting the bath to froth
flotation and removing the froth which contains the
bulk of the turbid impurities?" A Yes, sir.

Q You are getting out the bulk of the turbid impurities? A Yes, sir.

Q That is the same as substantially all of the turbid impurities, isn't it? A Yes, it is, turbid impurities in this case being colloidal sulphur.

Q The claim doesn't limit the turbid impurities to colloidal sulphur, does it? A You were referring to Claim 1?

Q Claim 1, or you can refer to any other claim. A That is true.

* * * *

178 Q With respect to Karlstrom's Patent No. 1,717,223 do you find any reference in that patent to the use of reagents? A No, I don't think I do.

Q What Karlstrom is intending to do there is to float off fibers from waste paper pulp with the aid of gas bubbles, isn't it? A Yes.

Q That is the way he defines his invention in Claim 1 of that patent, isn't it? A Yes.

Q He says the fibers are lifted up to the surface by gas bubbles? A Yes.

Q Would you say that is generally a flotation method of recovery? I am not talking about froth flotation, you understand; I am saying this is a general method

179 of flotation recovery. A Yes. The material is caused to float to the top of the solution but this is not froth flotation.

Q With respect to the Brown Patent No. 1,455,187, that centrifuge shown in Figure 2 could be by-passed periodically, couldn't it, for the purpose of cleaning? A Yes.

* * * *

Stuart A. Falconer,

a witness called by the plaintiff, being first duly sworn, was examined and testified as follows:

Direct Examination

BY MR. PARRY:

Q Will you state your name, residence and occupation? A My name is Stuart A. Falconer, 221 Hollow

Tree Ridge Road, Darien, Connecticut; I am employed by American Cyanamid Company in the Mineral Dressing Division, partly in the laboratory and partly in the field servicing various types of mineral dressing plants including froth flotation plants.

180 Q How many years experience have you had in connection with froth flotation? A My experience in froth flotation dates back 25 years.

Q What was your educational training? Are you a graduate engineer? A I am a graduate mining engineer from the University of British Columbia in 1924.

Q Have you had experience in connection with froth flotation in other fields than the mineral dressing field? A I have had a limited amount of experience, yes, in such things as rayon spin baths and clarification of wool effluents.

Q Are you familiar with the inventions involved in these suits dealing with the clarification of coolants? A Yes, I am.

Q Are you familiar with what the nature of the recovery is there, what solids are recovered, and where? A Yes.

Q Will you so state? A The solids recovered in the coolant clarification are the grit and abrasive material from the working operation.

Q Where is the recovery with respect to location? Is it at the bottom or top or both? A Recovery is made in this process at the top, and the amazing thing is that it is all at the top.

181 Q Do you feel from your experience in froth flotation that you qualify as an expert in that field of froth flotation? A I do.

Q Do you make that statement you have just made, that it is surprising to get all of the dirt off of these coolants at the top, as an expert? A I do. It is a most unusual thing, and in fact I don't know of any flotation operation in mineral dressing where complete recovery is obtained.

In mineral dressing with froth flotation we are separating one solid from another and even under ideal conditions the recovery is never 100 percent complete.

Q Is there anything else surprising about the nature of the operation dealing with these emulsion coolants? A The other thing that is surprising is that the emulsions are not broken down.

Q Why do you say that? A In view of the experience on the wool scouring where flotation is used to break down emulsions.

Q Are you familiar with the wool-fat froth flotation patent which has been referred to in these actions? A I am.

Q Is your statement based on your familiarity
182 with that patent or upon something else? A On
the familiarity with that patent and what I have
seen in the Botany Worsted plant where we installed
the flotation unit.

Q What is the essential nature of the operation with a wool fat recovery in terms of whether it is recovery of solids from solids or solids from liquids? A It is essentially recovery of liquid from liquid.

Q Is the wool fat in liquefied condition in the emulsion? A It is.

Q Is it at a high temperature? A That is the temperatures mentioned in the Broadbridge-Edser patent, around 30 degrees Centigrade.

Q I now hand you copies of the Booth patents No. 2,153,449 and No. 2,274,658 regarding the rayon spin bath clarification.

I think you stated a moment ago that you were familiar with that operation commercially, did you not? A Yes. I assisted in the installation of some of those early plants.

Q What is the nature of the rayon spin both? A It is essentially a chemical bath containing about 10 percent sulphuric acid and certain dissolved salts which result from the treating of the viscose in that bath, and sulphur, of course, which is given off in the reac-
183 tion when the viscose hits the bath.

Q What is the nature of this sulphur? Is it a solid? A It is a solid of very, very small size and it is characterized by being readily floatable.

Q Suppose you had grit and abrasive metals particles, such as we have in these coolant emulsions in their contaminated form, if those were in a rayon spin bath could they be recovered by froth flotation? I again ask you that in your opinion as an expert? A No, I don't think so.

Q Why? A Because for one thing the metal particles would be dissolved in that solution. The grinding grit, let's say the silicious material, would not be expected to float, and I make that statement because in many mineral dressing operations using froth flotation acid is actually used in the cleaning operation to drop out silicious material when you are floating such things as sulphide minerals.

Q With your knowledge of the two Booth patents is there anything that you find therein, and with your further actual experience in seeing these rayon spin bath operations, which would lead you to believe that emulsion coolants contaminated could be clarified by froth flotation? A No.

MR. PARRY: Direct examination closed.

184 MR. MOORE: No questions.

THE COURT: Step down, sir; thank you.

(Witness excused.)

Thereupon—

Frank A. Griffin,

a witness called by the plaintiff, being first duly sworn, was examined and testified as follows:

Direct Examination

BY MR. PARRY:

Q Please state your name, residence and occupation. A Frank A. Griffin; 20 Sunset Road, Darien, Connecticut; I am with the American Cyanamid Company, Sales Administration, Mineral Dressing Division.

Q Are you familiar with the inventions here involved? A Yes, I am generally familiar with them but not with all the technical details.

Q Are you familiar with the existing license relationship with the U. S. Hoffman Company? A I am; I negotiated it with them.

Q Am I correct from my understanding of the testimony of Mr. Bennett yesterday that he came to American Cyanamid asking for a license? A They came to us, yes.

Q Did you have any other companies become interested in becoming licensed under this froth flota-
185 tion system for coolants for these machine-working operations? A The Turbine Equipment Company in New York, who reported that they had the distribution of the DeLaval centrifuges for coolant clarification, approached the company and eventually got to me, and asked if they could secure sales rights or license under the coolant clarification process, so that they in turn could market it.

In addition to that company, Cincinnati Milling & Grinding Machine Company approached us twice. They were not making any coolant clarification equipment to my knowledge at the time, but they were sufficiently interested in the possibility of this to approach the company, and again were referred to me to obtain the rights to market the coolant clarification process that we had.

* * * *

Q I now hand you a document to be marked Plaintiffs' Exhibit No. 4 and ask you whether you can identify
the same? A The U. S. Hoffman Machinery Corporation entered into an agreement with us under
186 which they have to make quarterly reports. This
is a summary by years 1945 through 1949, inclusive, of the sales or I should say installations, made by the U. S. Hoffman Machinery Corporation.

Q Was this report prepared under your supervision? A It was prepared under my supervision by our general accounting department that takes care of these accounts.

Q Was it prepared from the American Cyanamid records at New York? A From the American Cyanamid records at New York but were taken from the reports sent in by the U. S. Hoffman Machinery Corporation.

Q If you will look at the first page there under the first name, Imperial Knife Company, Providence, Rhode Island, I find the figure 2-350 G. P. M. Will you explain what that means? A Yes. We indicated in each one, instead of just giving the name of the company, the gallonage per minute that the installations are built to treat.

Q What is the first figure? A The first one means it is a double cell and it treated 350 gallons per minute.

Caterpillar Military Engine Company, 95 G. P. M. You will find some for Ford, one in 2,000 gallons per minute.

Q But that identification is throughout the list? A Similar throughout, yes.

187 MR. PARRY: I would like to offer this compilation of installations which has been identified by the witness as Plaintiffs' Exhibit 4.

MR. MOORE: No objection.

(Document entitled "Coolant Clarification Installations sold by United States Hoffman Machinery Corporation" marked and received in evidence as Plaintiffs' Exhibit No. 4.)

MR. PARRY: That is all, Your Honor.

Cross Examination

BY MR. MOORE:

Q What were sold by the United States Hoffman Corporation to these various purchasers? A I have not seen any of their installations. I believe that they are complete installations that are sold in a complete unit to the plant.

THE COURT: To take care of all their machines?

THE WITNESS: Sludge disposal, all the equipment and machinery that is needed to operate their process.

BY MR. MOORE:

Q Does it include any lathe or boring machine? A Oh, no; this is just the coolant clarification system to go in their coolant system.

Q Does the purchaser supply the lathe and boring machine? A That is correct.

188 Q Does he supply the piping? A That is a detail I couldn't answer.

• • • •

Plaintiff's Ex. 4

Filed Jun 6 1951 Harry M. Hull, Clerk

Coolant Clarification Installations Sold By United States Hoffman Machinery Corporation
Year 1945

Order No.	
IF-1099	Imperial Knife Company Providence, Rhode Island 2—350 GPM
IF-1133	Caterpillar Military Engine Company Decatur, Illinois 90 GPM
IF-1243	Plymouth Motor Division Chrysler Corporation Detroit, Michigan 2—265 GPM
IF-1232	U. S. Hoffman Machinery Corporation Poughkeepsie, New York (Government War Plant)

Coolant Clarification Installations Sold By United States Hoffman Machinery Corporation
Year 1946

Order No.	
IF-1224	Electro Motive Division General Motors Corporation LaGrange, Illinois 2—90 GPM
IF-1269	Chevrolet Motor & Axle General Motors Corporation Buffalo, New York 500 GPM

IF-1285	McGill Manufacturing Company Valparaiso, Indiana 500 GPM
IF-1304	Stephens-Adamson Company Aurora, Illinois 500 GPM
IF-1251	Fafnir Bearing Company New Britain, Connecticut 1—350 GPM
IF-1334	Bullard Company Bridgeport, Connecticut 1—300 GPM
IF-1372	General Mills, Inc. Minneapolis, Minnesota 1—300 GPM
IF-1402	Ford Motor Company Dearborn, Michigan 1—1000 GPM
IF-1403	Ford Motor Company Northville, Michigan 1—300 GPM
IF-1254	New Departure Division General Motors Bristol, Connecticut 1—700 GPM

Coolant Clarification Installations Sold By United States Hoffman Machinery Corporation
Year 1947

Order No.	
IF-129	New Departure Division General Motors, Sandusky, Ohio 2—Dual Model 66 Units, 1400 GPM
IF-1484	Ahlberg Bearing Company Chicago, Illinois 1—Model 66—500 GPM

IF-1499	Bower Roller Bearing Company Detroit, Michigan 1—Dual Model 66—1000 GPM
IF-1592	New Departure Division General Motors, Bristol, Connecticut 1—Dual Model 66—700 GPM
IF-1593	New Departure Division General Motors, Bristol, Connecticut 1 Three Cell Model 66, 1050 GPM
IF-1609	Crucible Steel Company Syracuse, New York Model 56—300 GPM
IF-1597	Caterpillar Tractor Company Peoria, Illinois Model 36—90 GPM
IF-1588	Fafnir Bearing Company New Britain, Connecticut Model 50—175 GPM
IF-1633	Columbia Malleable Castings Corporation Columbia, Pennsylvania 2—Model 66—1000 GPM
IF-1644	Lincoln Motor Company Detroit, Michigan Model 66—500 GPM
IF-1684	Plymouth Motors Detroit, Michigan Model 56—250 GPM

Coolant Clarification Installations Sold By United States Hoffman Machinery Corporation

Year 1947—Continued

Order No.	
IF-1641	E. C. Atkins & Company Indianapolis, Indiana (3) Model 66—Total 1,500 GPM

IF-1620	Armstrong Blum Mfg. Company Chicago, Illinois Model 24—40 GPM
IF-1658	Universal Cooler Marion, Ohio Model 24—35 GPM
IF-1663	Ford Motors Detroit, Michigan Dual 66—700 GPM
IF-1681	Gleason Works Rochester, New York Model 18—20 GPM
IF-1649	Ford Motors Detroit, Michigan (5) Model 66—2,500 GPM
IF-1667	Rollaway Bearing Company Syracuse, New York Model 66—500 GPM
IF-1682	Ford Motors Detroit, Michigan (6) Model 66—3,000 GPM

Coolant Clarification Installations Sold By United States Hoffman Machinery Corporation

Year 1948

Order No.	
IF-1682	Ford Motor Company Detroit, Michigan (4) Model 66 Total 2,000 GPM
IF-1696	American Steel & Wire Company Cleveland, Ohio Model 36—60 GPM
IF-1685	Fafnir Bearing Company New Britain, Connecticut Model 56—175 GPM

IF-1721	Ingersoll Rand Company Athens, Pennsylvania Model 56—300 GPM
IF-1683	Plymouth Motors Detroit, Michigan Model 44—140 GPM
IF-1736	Bliss & Laughlin Harvey, Illinois Model 56—160 GPM
IF-1713	H. Disston & Son Philadelphia, Pennsylvania Model 24—25 GPM
IF-1764	Bliss & Laughlin Buffalo, New York Model 56—160 GPM
IF-1788	Buick Motors Flint, Michigan (4) Model 66 Total 2,000 GPM
IF-1793	International Business Machines Poughkeepsie, New York Model 66, 500 GPM
IF-1795	International Harvester Chicago, Illinois (3) Model 66, 1,500 GPM

Coolant Clarification Installations Sold By United States Hoffman Machinery Corporation Year 1948—Continued

Order No.	
IF-1775	Worthington Pump & Machinery Buffalo, New York Model 24, 300 GPM
IF-1792	General Electric Company Burlington, Virginia Model 56, 300 GPM

IF-1808 Fafnir Bearing Company
New Britain, Connecticut
Dual Model 66, 700 GPM

IF-1814 General Electric
Schenectady, New York
Model 24—40 GPM

IF-1830 International Business Machines
Endicott, New York
Model 24—40 GPM

IF-1847 Remington Arms
Bridgeport, Connecticut
Model 24—40 GPM

IF-1875 Aetna Ball & Roller Bearing Company
Chicago, Illinois
Dual Model 66—1,000 GPM

IF-1859 New Process Gear Corporation
Syracuse, New York
Model 44—150 GPM

IF-1874 Worthington Pump
Buffalo, New York
Model 24, 40 GPM

IF-1874 Worthington Pump
Buffalo, New York
Model 18-20 GPM

IF-1897 F. J. Stokes Machine Company
Philadelphia, Pennsylvania
Model 24, 40 GPM

Coolant Clarification Installations Sold By United States Hoffman Machinery Corporation
Year 1948—Continued

Order No.

IF-1899 Bower Roller Bearing Company
Detroit, Michigan
Model 66—1,500 GPM

IF-1907 Bendix Aviation
Bendix Products Division
Model 36, 90 GPM

Coolant Clarification Installations Sold By United States Hoffman Machinery Corporation
Year 1949

Order No.	
IF-1909	Eclipse Machine Company Elmira, New York Model 24 (dual)—80 GPM
IF-1919	Fansteel Corporation Chicago, Illinois Model 24, 40 GPM
IF-1937	Philco Corporation Philadelphia, Pennsylvania Model 24, 40 GPM
IF-1948	American Steel & Wire Company Worcester, Massachusetts (2)Model 36, 45 GPM each
IF-1949	Ingersoll Rand Company Phillipsburg, New Jersey Model 66, 500 GPM
IF-1946	Buick Motor Division North Flint, Michigan Model 56, 225 GPM
IF-1955	Cleveland Twist Drill Company Cleveland, Ohio Model 66, 500 GPM
IF-1966	Brunner Manufacturing Company Utica, New York Model 24, 40 GPM
IF-1954	Stowe-Woodward, Inc. Newton Upper Falls, Massachusetts Model 18, 20 GPM
IF-1974	General Electric Company Schenectady, New York (2) Model 24, 80 GPM
IF-1998	Caterpillar Tractor Peoria, Illinois Model 66, 500 GPM

Coolant Clarification Installations Sold By United States Hoffman Machinery Corporation
Year 1949—Continued

Order No.	
IF-2008	Brunner Manufacturing Company Utica, New York Model (Dual) 24—80 GPM
IF-2009	Eclipse Machine Division Elmira, New York Model (Dual) 24, 80 GPM
IF-2014	Oldsmobile Division, General Motors Corp. Lansing, Michigan (2) 66″ (Cells only), 1000 GPM
IF-2022	Studebaker Corporation South Bend, Indiana Model (Dual) 24, 80 GPM
IF-2059	International Harvester Company Chicago, Illinois Model (Dual) 66, 1000 GPM
IF-2059	International Harvester Company McCormick Works, Chicago, Illinois Model 66, 1,000 GPM
IF-2061	General Electric Schenectady, New York Model 24, 40 GPM
IF-2070	Chrysler Corporation Lynch Road Plant, Detroit, Michigan Model 66, 500 GPM
IF-2079	S.K.F. Industries Philadelphia, Pennsylvania Model 24, 40 GPM
IF-2081	Heil Grinding Company Rochester, New York Model 24, 40 GPM
IF-2082	New York Air Brakes Watertown, New York Model 24 (Dual), 80 GPM

The Application in Suit (Plaintiff's Ex. 1)

(Booth and Morash Appln. Ser. No. 443,016)
Specification

This invention relates to a method of clarifying lubricating coolants.

Light oil solutions of various soaps such as mahogany soap, fatty acid soaps, naphthenic acid soaps, various lubricants, wetting agents, anti-oxidants, thinners, etc., are cut with water and the resulting emulsions used in many different industries for cooling and lubricating purposes. Typical uses are found in the metal working arts where these emulsions are widely used as lubricating coolants in overcoming the heat of friction developed in cutting, grinding, extruding, drawing and other operations of a like nature. On the basis of economy it is desirable to reuse these emulsions to the greatest possible extent.

However, a definite limitation on the recirculation of the material is imposed by contamination with metal particles and cuttings, abrasive grit, dirt and the like which have been picked up from previous use. In addition to the particulate material, further contamination is caused by fatty-acid sludge created by the break-down of various components in the emulsion caused by the heat of friction which the emulsions are intended to overcome. The particles of solid material if present in any appreciable quantity in the recirculated material, cause scratching and scarring of the work and the sludge interferes with the cooling and lubricating functions of the oil emulsion.

Since these cutting oil emulsions represent a considerable real value there is a demand for a process whereby their useful life can be extended. Various attempts have been made in the past to do so by one means or another. One procedure has been to constantly remove a portion of the oil and replace it with fresh, and even though this produces no eventual improvement the procedure has many adherents. Attempts in the past to clarify the used emulsions by settling have not been successful. Nor has filtration proven a useful expedient because of the extreme difficulty in passing the material through screens fine enough to affect a satisfactory clarification. The use of filter aids such as Fuller's Earth or carbon results in increased cost both because of the material used and because of the added equipment and labor involved. Previous to the present invention there was no simple economical method of clarifying these cutting oil emulsions for reuse.

In addition to the economic importance of reusing the cutting oils, the solid contaminants may also represent a very appreciable real value which it may be desirable to recover. For example, in machine shops working on aluminum, brass or steel fittings, particularly where the machining operations involve considerable grinding, the cutting oil may acquire a considerable content of these metals in particulate form. The scrap value of these solid contaminants may even exceed the cost of revivifying the emulsion.

It is, therefore, an object of the present invention to provide a simple, effective process for clarifying these lubricating and cooling emulsions. It is also an object of the present invention to remove the contaminants in a physical form suitable for ready recovery of the solid matter.

According to the present invention two ways of accomplishing the object of the present invention in a satisfactory manner have been evolved; first, by subjecting the used emulsions to a froth flotation process whereby substantially all the contaminants may be floated; and second, by the use of suitable settling agents whereby substantially all the material may be caused to settle out and allow the clarified liquid to be decanted. The present application relates to the first of these procedures, the removal of the contaminants by flotation.

The invention may be illustrated in conjunction with the accompanying drawing in which Figure 1 shows an elevation in cross-section of one form of agitating and aerating device in which the rotor and stator of a standard Fagergren cell is employed. Figure 2 shows a flowsheet of the simplest type of hookup and Figure 3 shows a modified form of the flowsheet in which part of the contaminants may be removed before agitation and aeration and the recovery of material from the froth concentrate.

In general the present process comprises subjecting the used emulsions to froth flotation. A suitable device for this purpose is shown in Figure 1, a detailed description of the structure of which is set forth below. In its simplest form, the process of the present invention is illustrated by the flowsheet of Figure 2. The material to be modified is passed through the modifying operation which is lubricated and cooled by the emulsion-type coolant. The used coolant is passed directly to a clarifier such as that of Figure 1, the concentrated contaminants are removed with the froth layer, and clarified coolant is recirculated.

The operation of the process of the flowsheet in Figure 2, however, may not be adapted for larger scale operations. A suitable flowscheme therefor is shown in Figure 3. In Figure 3 a similar material-modifying step is illustrated with clarified coolant being circulated thereto and contaminated coolant being withdrawn therefrom. In order to equalize flow conditions, a storage tank for clarified coolant is provided into which discharge from the clarifier is made and from which clarified coolant is drawn for re-use.

It may be desirable to supplement the clarification operation by some additional procedure, as for example, settling or magnetic separation. Alternative flow steps for this purpose are shown. Similarly, it may be desirable in many cases to treat the flotation concentrate either to remove additional amounts of emulsion therefrom or to recover the solid constituents from the concentrate. Provision for this latter step is also shown in Figure 3.

In froth flotation procedures as carried out in ore dressing operations, it is customary to make use of various frothers and promoters either to increase the amount which can be floated or to increase the selectivity so that only certain desired portions are caused to float. Ordinarily such problems are not met in connection with the clarification of lubricating and cooling emulsions since here the peculiar problem of floating substantially all the solids is involved. A part of the contaminants is often self-floating and may be floated readily but the remander can only be floated with considerable difficulty unless the methods of froth flotation are applied.

Both because the composition of the emulsion itself may vary and because the nature of the impurities depends upon the use to which the emulsion has been put the flotation problem may present widely varied aspects. Since many of the cutting oil emulsions are made from oil containing various soaps it is often found that a sample of used emulsion when subjected to the action of a flotation machine froths readily and a good concentration can be had without the use of any additional reagents. With other samples, flotation without added reagents may not be effective in removing certain types of valuable contaminants. With samples of this kind it becomes necessary to make use of some froth flotation reagent or combination of reagents to insure a satisfactory result.

The choice of reagents will depend both upon the results desired and upon the nature of the oil to be treated. In addition, care must be taken that the reagents selected will not, either because of the quantity required or because of their intrinsic nature, modify the properties of the cutting oil so as to decrease its effectiveness for its intended purpose.

The addition of one of the common frothers such as pine oil, cresylic acids, mixtures of the higher aliphatic alcohols and the like may prove adequate in removing the particular impurities in question. Again it may be desirable to supplement their action by the use of various oils. These oils may be either of a saponifiable type such as the heavy glycerides or may be non-saponifiable oils such as fuel oil, kerosene and various other hydro-carbons. These may act as collecting agents, frothing agents, froth modifiers and the like in a similar manner to that in which they are employed in the field of ore dressing. As was pointed out, the grinding or cutting tool often develops a localized high temperature at the point of contact with the work-piece with a resultant breakdown into a sludge of certain constituents of the emulsion such as fatty acids. This is doubly troublesome in that the sludge formed by the breakdown not only destroys the efficiency of the emulsion for lubricating and cooling purposes but after the clarification of the emulsion these constituents are no longer present to perform their intended function. Because of this, where a fatty acid or fatty acid product flotation reagent can be used they have the added advantage of replacing a part of the emulsion content lost by breakdown.

It is also an advantage of the present invention that since only a small amount of reagent is normally required it may often be added to or compounded with the cutting oil before use without any noticeable effect on efficiency of the latter. Where the additional reagents are added at the time of flotation it is well, although not absolutely necessary, to condition the emulsion with the reagents for a few seconds before starting the actual flotation.

Where there is a central cutting and cooling oil circulating system in a machine shop the same emulsion may eventually be used on a number of different materials. As a result the impurities picked up by the emulsion in the system may comprise quite a wide variety of different materials. It is often desirable not only to separate these constituents from the cutting oil but from each other and from the non-useful contaminants. To do this a variety of flotation reagents may be used in a succession of steps each to perform its particular function on some particular contaminant. In such a case the reagents obviously can not be added to the recovery system effectively at any other point than just prior to the flotation stage in which the particular reagent is necessary. Except in these cases, however, the present invention is not limited to any particular point at which the flotation reagents are to be introduced into the circuit.

It is also an advantage of the present invention that it is not limited to any particular type of flotation apparatus. In the experimental development work a Fagergren flotation machine was found to produce excellent results. Such a clarifier is shown in Figure 1 in which the apparatus comprises an outer casing 1 enclosing three compartments 2, 3 and 4 which are separated from each other by means of partitions 5 and 6 and a false bottom 7. Chambers 2 and 3 are interconnected by a large opening 9 in the false bottom 7. Supported by the false bottom and immediately above opening 9 is located stator 10 of a mechanical-type flotation unit. Rotor 11, located within the stator, is turned by the rotation of shaft 12 which in turn may be motivated by any conventional driving mechanism. Mounted on the stator 10 and surrounding shaft 12 is a shield or hood 14, resembling an inverted funnel.

Contaminated coolant enters the clarifier through inlet 8, passes through chamber 2 and into chamber 3 through opening 9 under the stator 10. Rotation of rotor 11 not where the volume to be handled is so limited that the overhead will not justify more than a single cell the advantages of series operation may often be obtained by successive passes through this cell.

The invention will be more fully illustrated in connection with the following examples which are meant to be illustrative only and not by way of limitation. All parts are by volume unless otherwise noted.

Example 1

3000 parts of used, contaminated emulsion containing sludge metal particles and abrasive grit were subjected to a flotation without the use of any additional reagents for 2 minutes using a rotor speed of 1500 R.P.M. The solids floated readily and the froth gradually increased in volume as the solids were removed. About 570 parts of concentrate were collected of which subsequent analysis showed 220 parts to be solids and 350 parts to be liquor. Analysis of the clarified liquors indicated that 99.98% of the contaminants had been removed by this flotation treatment.

Several such portions were treated in this manner. In every case the operation left a substantially completely clarified emulsion. The froth concentrate in each case was allowed to stand and the solids separated readily therefrom by settling. The supernatant liquid was decanted and added to the flotation feed in a subsequent portion of contaminated emulsion. In each case practically complete removal of the suspended solids was obtained and the clarified emulsion was found suitable for use.

This example illustrates three facts. First, that contaminated emulsions may be readily clarified by flotation methods. Second, the solid contaminants may be readily separated from the froth concentrate by settling. Third, that the liquors separated from the froth concentrate may be recovered and reused by returning them to the flotation feed. A consideration of these facts indicate that the process as a whole has a very high overall efficiency.

Example 2

The procedure of Example 1 was tried on a 3000 part sample of another used emulsion and only 91.53% of the solids was found to be removed. The experiment was repeated using an alcoholic solution of ammoniated talloel in an amount equivalent to 0.1 lbs./ton of emulsion as a promoter. The sample was conditioned for 15 seconds with the reagent and then floated for 1½ minutes. 450 parts of concentrate were collected of which 230 parts were liquor. Analysis of the clarified emulsion indicated that 99.96% of the contaminants had been removed.

As has been pointed out most of the contaminated emulsions found in actual practice contain a certain amount of material which may be more or less readily settled. Advantage can be taken of this fact to relieve the load imposed upon the flotation process and thereby in many cases escape the use of excessive amounts of reagent. This procedure will be illustrated by the following example.

Example 3

A 3000 cc. sample of a contaminated emulsion was found to have a variety of contaminants, a portion of which floated readily, a portion tending to remain suspended and a portion which tended to settle. The sample was allowed to stand for a period of ½ hour at the end of which time a considerable portion of the contaminants were found to have settled. This portion contained most of the coarser particles of metal and made up about 15% of the total impurities. The supernatant liquid was then decanted and subjected to froth flotation as in Example 1, no added reagents being required. Examination of the clarified emulsion indicated that it was substantially free from all impurities.

A substantially 100% clarification of the emulsion was readily produced by this combination of settling and flotation. This is of particular advantage in those cases where the coarser material requires either an expensive reagent for successful flotation or excessive amounts of reagents.

Where the nature of the emulsion permits, settling aids may be used to increase the proportion of the material removed before the flotation step. A number of well-known wetting agents and the like were tried as settling aids. It was found, curiously enough, that the same compounds which were most effective as catonic-type flotation promoters were most effective in settling the solids. The following agents and proportions appeared to be most effective with the used emulsion of Example 3; the reaction products of poly-ethylene poly-amines and mixed fatty acids of about C_{12} in the ratio of 2.5 lbs./ton; n-decyl and n-tetradecyl pyridinium chloride in amounts of about 3 lbs./ton and "Lorol" amine hydrochloride in a ratio of about 5 lbs./ton. While these reagents were most effective with this sample, the invention is not meant to be so limited.

Some reagents such for example as the mixed polyethylene polyamine reaction products and "Lorol" amine hydrochloride are soluble in the original light oil. These reagents therefore possess an added advantage that in many cases they may be added to or compounded with the original light oil solution and allowed to remain present throughout future operations, thus being ready at all times to perform their intended function.

The flotation process may be in some cases advantageously used in combination with other known separation processes such as tabling, filtering, centrifuging and the like. This combination of processes is especially advantageous in those cases where the contaminated emulsion contains solid particles of greatly varying particle size. By applying one of these methods to the emulsion as a whole, portions which are difficult to float and yet can not readily be removed by settling may be separated and thereby reduce the work which must be done by the flotation. In many cases it may also enable very appreciable savings in the amount of reagents required. The following example illustrates a process in which flotation and tabling processes may be combined.

Example 4

Several gallons of used emulsion containing sludge, grit and metal particles of varying size were treated on a laboratory Wilfley table. Solids relatively coarse in particle size and amounting to about 35% of the total solids were removed by this treatment. The residual liquid was then subjected to the procedure of Example 1. A substantially completely clarified emulsion was produced.

A combination of two processes such as the flotation and tabling of Example 4 greatly adds to the efficiency and flexibility of the process.

An obvious modification is to first treat the whole emulsion by a flotation step in order to remove the fines and then table the residual emulsion in order to remove particles which could not be readily floated. While a good clarification can be produced in this way, it has the disadvantage of having the large pieces present during the flotation step where they can do no good and may cause trouble.

As was also pointed out in the discussion above, in many cases the recovery of one or more of the contaminants may be equally important with the revivification of the cutting oil. The procedure in such a case will be illustrated by the following example.

Example 5

A 3000 cc. sample of a sludge-containing emulsion which had been used in the processing of aluminum parts was treated as in Example 1 above. Approximately 200 cc. of liquid were removed with the froth concentrate and approximately 1800 cc. remained in the flotation cell. The solids were removed from the froth concentrate and divided into 3 approximately equal portions each being treated respectively with benzene, carbon tetrachloride and acetone to remove oil and grease. The metal particles settled out from the solvent in a substantially oil-free condition and the oil-containing solvent was removed by decantation. In each case the metal particles were separated in a form suitable for recovery. Satisfactory results were obtained in each case. However, the metal particles settled more freely from the acetone solution and therefore this solvent appears to possess a certain advantage.

A study of the above procedure developed several conclusions. Microscopical examination of the oil emulsion as fed to the flotation cell indicated that much of the impurity existed in the form of very fine particles which exhibited Brownian movement and were apparently free. A microscopical examination on a sample of the clarified emulsion indicated that all material having a particle size larger than 1 micron had been removed. However, a microscopical examination of a representative portion of the concentrate indicated that considerable amounts of the material having a particle size less than 1 micron had been removed as well as those of larger size. The majority of these fine particles present in the concentrate were in the form of agglomerates. Apparently the action of the flotation cell is not only to remove all the particles above a certain size but also to cause agglomeration of those of smaller size which results in their subsequent removal.

Substantially 100% of the aluminum was removed from the contaminated emulsion by the flotation treatment. Essentially, a complete recovery of aluminum was therefore obtained. It is therefore apparent that the flotation treatment has an extraordinarily high efficiency, whether from the point of view of recovering fine metal particles of this type or from the point of view clarifying the emulsion.

While only benzene, carbon tetrachloride and acetone were mentioned in this example the process is by no means so limited. The choice of the solvent would depend upon the particular oils, greases or other contaminants which were to be removed from the metal. In some cases a plurarity of solvents in succession may be required to accomplish an adequate extraction. A simple distillation serves to recover the solvent and thereby permits it to be reused at little expense.

With contaminated emulsions from the average metal working shop, the bulk of the contaminants will comprise particles of magnetizable material such as iron or steel. It is possible to take advantage of this property in a number of different ways. For example the magnetizable material may be made to settle from the emulsion by the used of a magnetic field. A sample containing magnetizable material was settled by the aid of a magnetic field. This produced 99.7 to 99.9% removal of all the suspended solids in some cases but in others it was found that an effective clarification could not be made in this manner. Samples of this latter type were then subjected to flotation as in Examples 1 and 2. A magnetic field was then found to be effective in pulling the magnetizable material from the froth concentrate.

By first subjecting the used emulsion to a flotation step and then flowing the froth concentrate across a magnetic separator the magnetizable material can be recovered per se. Alternatively, the whole emulsion before the flotation step may be flowed across a magnetic separator and the flotation step then applied. This procedure while giving good clarification did not give quite as good a separation of cleaned magnetizable material as did the magnetic treatment of the froth concentrate after flotation.

The combination of magnetic separation and flotation in which the emulsion is first passed over a magnetic separator and then floated is especially advantageous however in the case where the contaminated emulsion contains both magnetizable material such as iron or steel and non-magnetizable particulate material such as aluminum or brass. This procedure will be illustrated by the following example.

Example 6

A 2000 cc. sample containing about 1 part of soluble oil in 20 parts of water, about 1.9 gms. of finely divided iron filings and about 3.6 gms. of finely divided aluminum metal was caused to flow through a magnetic field. The emulsion after passing the magnetic separator was transferred to a flotation cell and treated as in Example 1. The residual emulsion after flotation was found to be 99.98% free from suspended solids. The iron and aluminum contained in the froth concentrate were readily separated by drying and magnetic treatment. Examination of the material removed by the first magnetic treatment proved it to comprise approximately 95% of the iron and a portion of aluminum. The aluminum was readily recovered by drying the mass and removing the steel from it by a further magnetic treatment.

The Claims in Suit

33. The process of clarifying a used, oil-in-water, emulsion-type, lubricating coolant contaminated by solid particles, without appreciably altering the physical properties of the original coolant, which comprises the steps of simul-

taneously subjecting a volume of said used coolant to aeration and intense agitation in the absence of added reagents, whereby a froth layer is formed at the surface of said coolant volume and substantially all said contaminants are concentrated in said froth layer as it forms; removing the contaminant-bearing froth from said froth layer and recovering the so clarified coolant.

34. The process of clarifying a used, oil-in-water, emulsion-type, lubricating coolant contaminated by solid particles, without appreciably altering the physical properties of the original coolant, which comprises the steps of simultaneously subjecting a volume of said used coolant to aeration and intense mechanical agitation in the absence of added reagents, whereby a froth layer is formed at the surface of said coolant volume and substantially all said contaminants are concentrated in said froth layer as it forms; removing the contaminant-bearing froth from said froth layer and recovering the so clarified coolant.

35. A process according to Claim 42 adapted for use when a part of the solid contaminants are magnetically susceptible in which the contaminated coolant is subjected to field of magnetic force of sufficient intensity to remove substantially all the magnetically-susceptible contaminants before being subjected to the agitating and aerating operation.

36. The process of continuously removing substantially all the solid particles from a used, oil-in-water emulsion-type lubricating coolant contaminated thereby, without appreciably altering the physical properties of the original coolant, which comprises the steps of subjecting a substantially fixed volume of contaminated coolant simultaneously to aeration and intense agitation in the absence of added reagents, whereby a froth layer is formed at the surface of said coolant volume and substantially all said contaminants are concentrated in said froth layer as it

forms; continuously skimming contaminant-bearing froth from said froth layer at substantially the rate at which the froth is formed; continuously withdrawing clarified coolant from said coolant volume at a level below the froth layer and continuously adding contaminated coolant to said coolant volume, at substantially the same rate that clarified coolant is decanted therefrom, but at a point other than that at which the clarified coolant is withdrawn.

37. A process according to Claim 34 in which the collected froth is allowed to stand for sufficient time to allow the froth to collapse, whereby separate layers of highly contaminated and relatively clean coolant are obtained, fluid is decanted from the relatively clean layer, the fluid decanted from said relatively clean layer is returned to the aerating and agitating step and the separated contaminants collected.

38. The process of continuously removing substantially all the solid particles from a used, oil-in-water, emulsion-type, lubricating coolant contaminated thereby, without appreciably altering the physical properties of the original coolant, which comprises the steps of subjecting a substantially fixed volume of contaminated coolant simultaneously to aeration and intense mechanical agitation in the absence of added reagents, whereby a froth layer is formed at the surface of said coolant volume and substantially all said contaminants are concentrated in said froth layer as it forms; continuously skimming contaminant-bearing froth from said froth layer at substantially the rate at which the froth is formed; continuously withdrawing clarified coolant from said coolant volume at a level below the froth layer and continuously adding contaminated coolant to said coolant volume, at substantially the same rate that clarified coolant is decanted therefrom, but at a point other than that at which the clarified coolant is withdrawn.

39. The process of continuously clarifying a used, water-in-oil, emulsion-type, lubricating coolant contaminated by solid particles which vary widely in size and degree of agglomeration, without appreciably altering the physical properties of the original coolant, which comprises the steps of subjecting the contaminated coolant to settling for only a sufficient time to remove those larger and agglomerated contaminants of sufficient mass to be unamenable to froth flotation, collecting the settled contaminants, subjecting the coolant and the residual contaminants therein simultaneously to aeration and intense agitation in the absence of reagents whereby a froth layer is formed at surface of said coolant and substantially all the residual contaminants are concentrated in said froth layer as it forms, removing the contaminant-bearing froth and recovering the clarified coolant.

40. The process of continuously clarifying a used, oil-in-water, emulsion-type lubricating coolant contaminated by solid particles, which particles vary widely in size and degree of agglomeration, without appreciably altering the physical properties of the original coolant, which comprises the steps of continuously passing the contaminated coolant through a relatively quiescent zone in which the period of dwell is only sufficient to permit those larger and agglomerated contaminants of sufficient mass to be unamenable to froth flotation to settle; collecting the settled contaminants; passing the partially-clarified coolant and the residual contaminants into a substantially fixed volume of coolant, simultaneously subjecting said fixed volume to aeration and intense agitation in the absence of added reagents, whereby a froth layer is formed at the surface thereof; continuously removing contaminant-bearing froth from said froth layer at substantially the rate at which froth is being formed; and continuously recovering clarified coolant from said fixed volume at substantially the same rate that partially-clarified coolant is added thereto from a level below said froth layer.

41. The process of clarifying used, oil-in-water, emulsion-type, lubricating coolants contaminated by metallic and other solid particles, without appreciably altering the physical characteristics of the original coolant, which comprises the steps of establishing a volume of used coolant having a free surface; simultaneously subjecting said volume of used coolant to aeration and agitation sufficient to form at said free surface a froth layer containing substantially all of said contaminants concentrated in said froth layer, collecting the contaminant-bearing froth from the so-treated coolant and recovering the so-clarified coolant.

42. The process of clarifying used, oil-in-water, emulsion-type, lubricating coolants contaminated by metallic and other solid particles dispersed therein, without appreciably altering the physical properties of the original coolant, which comprises establishing a volume of used coolant having a free surface; simultaneously subjecting said volume of used coolant to sufficient aeration and intense physical agitation, whereby a froth layer is formed at said free surface and substantially all said contaminants are concentrated in said froth layer; removing the contaminant-bearing froth from the so-treated coolant and recovering the so-clarified coolant.

43. The process of continuously removing substantially all of the solid particles from a used, oil-in-water, emulsion-type, lubricating coolant, contaminated by metallic and other solid particles dispersed therein, without appreciably altering the physical properties of the original coolant, which comprises the steps of establishing a substantially fixed volume of contaminated coolant having a free surface, subjecting such volume of contaminated coolant simultaneously to aeration and intense physical agitation sufficient to form at said free surface a froth layer, whereby substantially all of said contaminants are concentrated in said froth layer as it forms; continuously skimming

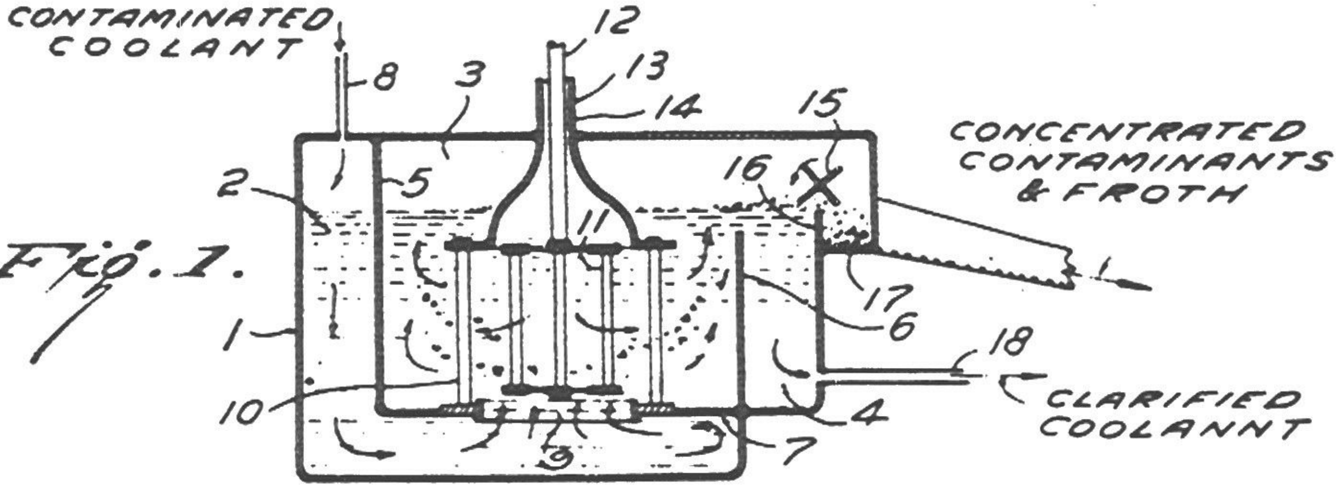

Fig. 1.

COOLANT CLARIFIER

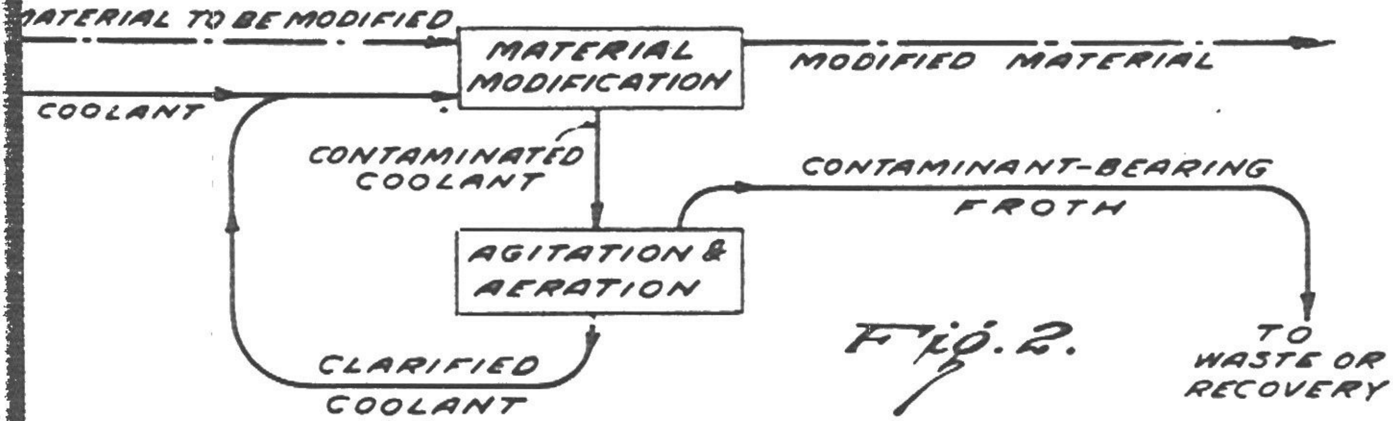

Fig. 2.

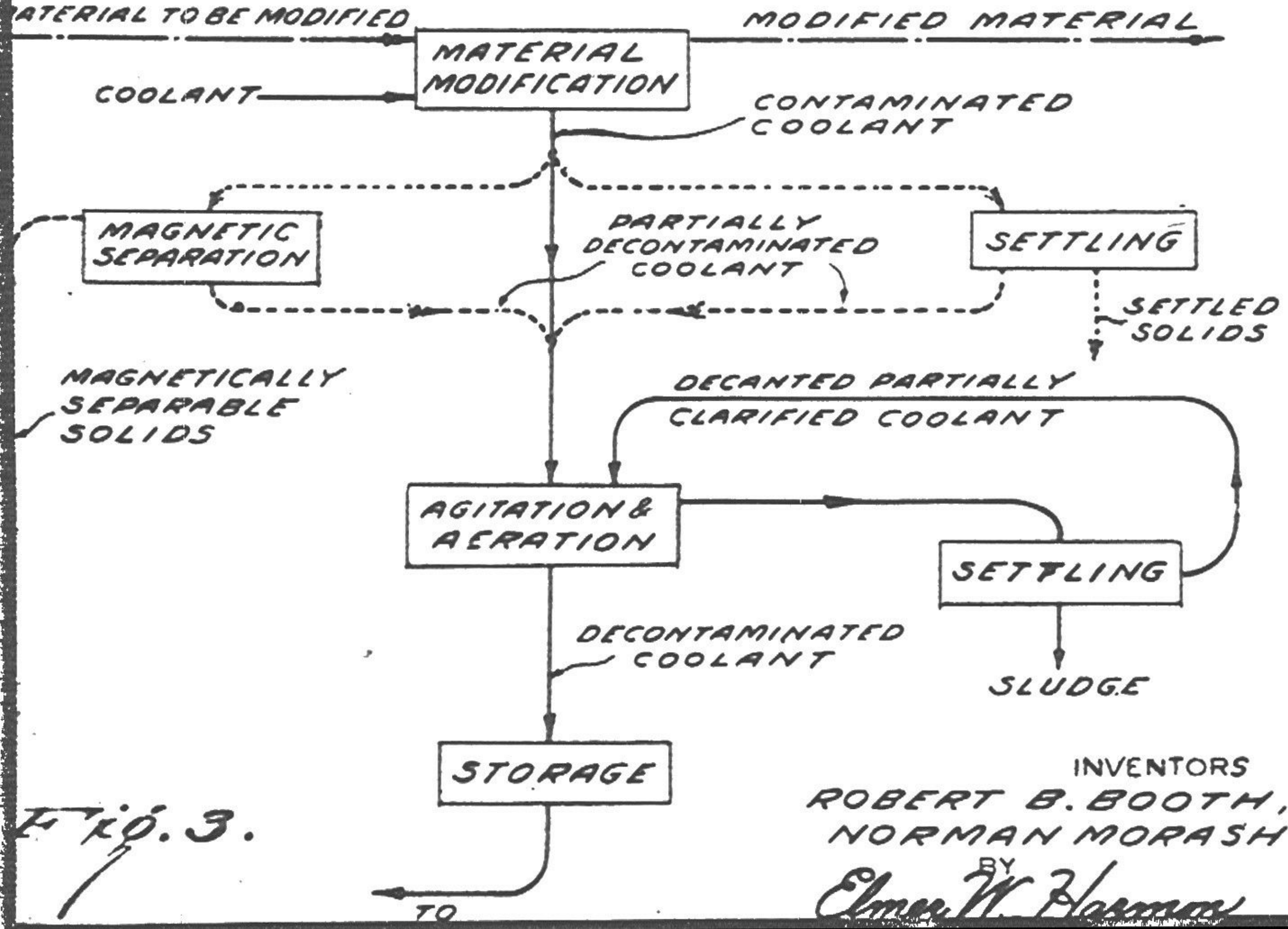

Fig. 3.

INVENTORS
ROBERT B. BOOTH,
NORMAN MORASH,
BY
Elmer W. Harmon

contaminant-bearing froth from froth layer at substantially the rate at which the froth is formed; continuously withdrawing clarified coolant from the so-treated coolant volume at a level below the froth layer and continuously adding contaminated coolant to said coolant volume at substantially the same rate that clarified coolant is withdrawn therefrom, but at a point other than that at which the clarified coolant is withdrawn.

Mailed Feb. 17, 1947

Division 25 Paper No. 17
Room 7079 RDN:lbh

DEPARTMENT OF COMMERCE
United States Patent Office
Washington

In re application of Robert B. Booth et al., Serial No. 443,816, Filed May 20, 1942, For: Method for Clarifying Lubricating and Cooling Emulsions.

Before The Board of Appeals On Appeal

Examiner's Statement

This is an appeal from the decision of the Primary Examiners of Divisions 25 and 49 in finally rejecting under dual prosecution certain claims of the above entitled application. Claims 34, 37 and 38 are indicated as allowable.

Claims 35, 39 and 40, which have been rejected by Division 25, read as follows:

35. A process according to Claim 42 adapted for use when a part of the solid contaminants are magnetically susceptible in which the contaminated coolant is subjected to field of magnetic force of sufficient intensity to remove substantially all the magnetically-susceptible contaminants before being subjected to the agitating and aerating operation.

39. The process of continuously clarifying a used, water-in-oil, emulsion-type, lubricating coolant contaminated by solid particles which vary widely in size and degree of agglomeration, without appreciably altering the physical properties of the original coolant, which comprises the steps of subjecting the contaminated coolant to settling for only a sufficient time to remove those larger and aglomerated contaminants of sufficient mass to be unamenable to froth flotation, collecting the settled contaminants, subjecting the coolant and the residual contaminants therein simultaneously to aeration and intense agitation in the absence of reagents whereby a froth layer is formed at surface of said coolant and substantially all the residual contaminants are concentrated in said froth layer as it forms, removing the contaminant-bearing froth and recovering the clarified coolant

40. The process of continuously clarifying a used, oil-in-water, emulsion-type lubricating coolant contaminated by solid particles, which particles vary widely in size and degree of agglomeration, without appreciably altering the physical properties of the original coolant, which comprises the steps of continuously passing the contaminated coolant through a relatively quiescent zone in which the period of dwell is only sufficient to permit those larger and agglomerated contaminants of sufficient mass to be unamenable to froth flotation to settle; collecting the settled contaminants; passing the partially-clarified coolant and the residual contaminants into a substantially fixed volume of coolant, simultaneously subjecting said fixed volume to aeration and

intense agitation in the absence of added reagents, whereby a froth layer is formed at the surface thereof; continuously removing contaminant-bearing froth from said froth layer at substantially the rate at which froth is being formed; and continuously recovering clarified coolant from said fixed volume at substantially the same rate that partially-clarified coolant is added thereto from a level below said froth layer.

The references relied upon by Division 25 are:

Brown 1,455,187 May 15, 1923
Munro 1,937,837 Dec. 5, 1933
Booth 2,153,449 Apr. 4, 1939

This application relates to a process of recovering the lubricant used in metal working processes such as cutting, grinding, etc.

This application is directed to a process for reclaiming coolants which consist of emulsions of water with light oil solutions of soaps. The working of metal results in a large quantity of fine particles of metal and abrasive being carried in suspension in the coolant. The applicants' process is designed to remove these particles from the liquid so that the liquid may be reused.

The process of recovery consists of two steps. The first step is to remove material which readily separates from the liquid under the influence of a force such as gravity or magnetism. The second step is to separate the fine particles from the liquid. This step consists of aerating and agitating the liquid as for froth flotation. Some coolants contain enough soaps to produce a froth without added reagents. With other coolants it is necessary to add frothing agents and collecting agents to cause the particles of material to adhere to the air bubbles and to be carried into the froth. The specification suggests a number of reagents which could be used.

The patent to Brown discloses a machine for grinding metals in which a coolant consisting of oil and water is used. The patent states that it is customary to conduct the used coolant contaminated with particles of abrasive and metal to a settling tank. In the settling tank the larger particles of solids deposit out of the coolant and the partially purified material is returned to the supply tank. The patentee disclosed that it was desirable to remove the finer particles from the coolant and proposed to use a centrifuge to remove these particles.

The patent to Munro describes in the various figures and shows a process of treating ores by flotation in which a suspension of ground ore is separated by allowing the larger particles to settle and subjecting the remaining material to agitation and aeration to remove desired fine particles. The feed from the mill may be introduced in the classifier portion as in Figure 5 to allow the coarser particles to settle before the finer particles are removed by froth flotation.

The patent to Booth 2,153,449 shows the removal of contaminants from a rayon-spinning bath by subjecting the bath to aeration and agitation which causes a flotation of the contaminants.

Claim 39 calls for the process of clarifying a used water-in-oil emulsion coolant containing solid particles differing in size, by allowing the larger particles to settle and subjecting the remaining suspension to froth flotation in the absence of reagents. The claim has been held to be lacking in invention in the alleged combination of steps. In considering this claim, each of the steps may be assumed to be old and the claim tested by determining whether the association of such old steps would be inventive. In re Pineo, 70 U.S.P.Q. 591 O.G. 329.

The patent to Brown shows that it is old in this art to subject a coolant to a settling step to permit the removal of the larger particles and then to submit the partially purified coolant to a second purifying operation to remove the finer particles from the coolant.

The patent to Munro shows that prior to treating suspension to froth flotation it is common to remove the large particles.

It has been held that the successive separations cooperate to produce a new result. Each step removes only a definite fraction which would not be removed in the other step. It is common to use these steps in this order, and the novelty of either step does not lend patentability to the claim.

Claim 40 is drawn to substantially the same subject matter as claim 39 and differs therefrom only in specifying that the settling operation is conducted in a relatively quiescent zone for a limited period. This feature is generally true of all settling operations and does not distinguish from the rejection made for claim 39.

Claim 35 is rejected as it is drawn to a non-elected species.

Respectfully submitted,
C. A. Blakely,
Examiner Division 25.

Mailed Feb 17 1947

Division 25 — Paper No. 17A
Room 7079 — BB-en

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON, D. C.

In re application of Robert Ben Booth and Norman Morash Serial No. 443,816, Filed May 20, 1942, For: Method for Clarifying Lubricating and Cooling Emulsions

Before the Board of Appeals on Appeal

Examiner's Statement

This is an Examiner's Statement under Dual Prosecution practice by Division 49 on finally rejected Claims 33, 36, 41, 42 and 43. Claims 34 and 38 inclusive have been indicated as allowable in this Division. General jurisdiction of the application is in Division 25.

The finally rejected claims covered in this Statement are as follows:

Claim 33. The process of clarifying a used, oil-in-water, emulsion-type, lubricating coolant contaminated by solid particles, without appreciably altering the physical properties of the original coolant, which comprises the steps of simultaneously subjecting a volume of said used coolant to aeration and intense agitation in the absence of added reagents, whereby a froth layer is formed at the surface of said coolant volume and substantially all said contaminants are concentrated in said froth layer as it forms; removing the contaminant-bearing froth from said froth layer and recovering the so clarified coolant.

Claim 36. The process of continuously removing substantially all the solid particles from a used, oil-in-water emulsion-type lubricating coolant contaminated thereby, without appreciably altering the physical properties of the original coolant, which comprises the steps of subjecting a substantially fixed volume of contaminated coolant simultaneously to aeration and intense agitation in the absence of added reagents, whereby a froth layer is formed at the surface of said coolant volume and substantially all said contaminants are concentrated in said froth layer as it forms; continuously skimming contaminant-bearing froth from said froth layer, at substantially the rate at which the froth is formed; continuously withdrawing clarified coolant from said coolant volume at a level below the froth layer and continuously adding contaminated coolant to said coolant volume, at substantially the same rate that clarified coolant is decanted therefrom, but at a point other than that at which the clarified coolant is withdrawn.

Claim 41. The process of clarifying used, oil-in-water, emulsion-type, lubricating coolants contaminated by metallic and other solid particles, without appreciably altering the physical characteristics of the original coolant, which comprises the steps of establishing a volume of used coolant having a free surface; simultaneously subjecting said volume of used coolant to aeration and agitation sufficient to form at said free surface a froth layer containing substantially all of said contaminants concentrated in said froth layer, collecting the contaminant-bearing froth from the so-treated coolant and recovering the so-clarified coolant.

Claim 42. The process of clarifying used, oil-in-water, emulsion-type, lubricating coolants contaminated by metallic and other solid particles dispersed therein, without appreciably altering the physical properties of the original coolant, which comprises establishing a volume of used coolant having a free surface; simultaneously subjecting said volume of used coolant to sufficient aeration and intense physical agitation, whereby a froth layer is formed at said free surface and substantially all said contaminants are concentrated in said froth layer; removing the contaminant-bearing froth from the so-treated coolant and recovering the so-clarified coolant.

Claim 43. The process of continuously removing substantially all of the solid particles from a used, oil-in-water, emulsion-type, lubricating coolant, contaminated by metallic and other solid particles dispersed therein, without appreciably altering the physical properties of the original coolant, which comprises the steps of establishing a substantially fixed volume of contaminated coolant having a free surface, subjecting such volume of contaminated coolant simultaneously to aeration and intense physical agitation sufficient to form at said free surface a froth layer, whereby substantially all of said contaminants are concentrated in said froth layer as it forms; continuously skimming contaminant-bearing froth from froth layer at substantially the rate at which the froth is formed; continuously withdrawing clarified coolant from the so-treated coolant volume at a level below the froth layer and continuously adding contaminated coolant to said coolant volume at substantially the same rate that clarified coolant is withdrawn therefrom, but at a point other than that at which the clarified coolant is withdrawn.

The following references have been relied upon:

Karlstrom 2,248,177 July 8, 1941 210-53
Karlstrom 1,717,223 June 11, 1929 210-53
Sulman et al 835,120 Nov. 6, 1906 210-53

Claim 33 relates to a process for clarifying a lubricating coolant of the oil-in-water, emulsion type, which contains solid particles. The claim sets forth as steps of the process, first, that a volume of the coolant is simultaneously subjected to aeration and intense agitation, whereby a froth layer is formed at its surface which contains substantially all the contaminants in the volume of coolant, second that the froth is removed from the froth layer, and third, that the clarified coolant is recovered.

In Karlstrom 1,717,223 an apparatus is disclosed for the recovery of fibers from waste or back-water from cellulose, paper and wood-grinding mills. Three different embodiments of an apparatus for performing this process are dsiclosed in the reference.

A tank 1 is used having an open bottom which projects down into an open vat or reservoir 2 having a discharge conduit 3 in its bottom. A conduit 4 enters the tank 1 at its center to serve as an inlet for the liquid containing fibers and mixed with air or gas. This inlet conduit is widened at its discharge end 5 and is vertical so that the liquid to be treated is supplied to the tank in an upward current. At its discharge end the inlet is also provided with a horizontal flange 51 which prevents any sudden change in the movement of the particles nearest the wall of the inlet conduit. A conduit 6 extends from the top of the tank 1 which is connected to a vacuum pump. Through this conduit the fiber mass is sucked off, the quantity drawn off being regulated by a valve 7.

The embodiment of Fig. 2 varies from that described in that instead of using a separate tank or reservoir 2, it is combined as an integral tank with the tank 1.

In the form shown in Fig. 3, the tank 1 is formed with a conduit 4 which projects down into the reservoir 2, which is connected by a conduit 13 with another reservoir 14, wherein the liquid to be treated is aerated, such aeration taking place by means of an injector 16 connected to a feed conduit 17 and an air conduit 18. Any foam formed in reservoir 14 is drawn into the injector through a conduit 19, while the foam in reservoir 2 is drawn off through a conduit 20 to the reservoir 14. A discharge conduit 3 for clarified water is connected to the bottom of tank 1, the mass of fibers being drawn off through conduit 6.

The Karlstrom patent 2,248,177 discloses an apparatus for a similar purpose. Several embodiments of apparatus are shown.

Referring to Fig. 1, a separating tank 1 is provided in which the water to be purified is introduced through a vertical central tube 2. The aerated water flows through a conduit 3 to an open container 4, having vertical baffles therein, which create a long flow path for the liquid before it enters the inlet tube 2, which depends at its bottom into the container 4.

In the tank 1, the particles rise to the surface of the liquid and are drawn off by means of the suction nozzle 6, connected to a conduit 8, in turn connected to the suction pump 181. Purified water is drawn off through a conduit 10. An agitating device 14 is provided in the inlet tube 2.

In the patent to Sulman et al an apparatus is disclosed for the concentration of ores for the purpose of separating metalliferous matter, graphite etc. from the gangue by means of oils, fatty acids or other substances.

A mixing vessel A is provided with a stirrer B and a mixture of oil and crushed ore is fed to the vessel. In the vessel a froth is produced, the mixture being led off from the vessel through a conduit H which communicates with the froth separating apparatus. This apparatus comprises a series of boxes J^1 J^2 J^3 which are open at the top to a horizontal channel K, having a narrow inlet K′ and a wide outlet K^2. The pulp from the mixing vessel A is distributed horizontally over the boxes J. The heavy sand and coarse partciles sink into the first box, the medium sands into the second, and so on. The froth remains above the boxes and is carried over the outlet K^2 into launder P, and then to filter Q, from which the water is returned to the mixing vessel.

The claim is considered to present no invention over the above references which show a process for removing particles from a liquid comprising the steps of subjecting a volume of the contaminated liquid to aeration and intense agitation to form a froth layer at the surface of the liquid, removing the froth and recovering the clarified liquid.

The use of the structures of the references to treat applicant's lubricating coolant, is not considered to involve any invention.

Claim 36 adds the step of continuously adding contaminated liquid to the liquid being treated at the same rate that clarified liquid is withdrawn. This is an obvious step and is considered to be implied in Claim 33, as well as in the references. Clearly if more liquid is taken out of the process than is put into it, the apparatus will soon stop functioning.

Claim 41 relates to a process for clarifying lubricating coolant, which comprises the steps of (1) establishing a volume of used coolant, (2) simultaneously subjecting said volume to aeration and agitation to form a froth layer at the surface of the volume of liquid, (3) collecting the froth and (4) recovering the clarified coolant.

This claim is held to be indefinite and functional as to "establishing" and "subjecting" in accordance with the decision in re Caunt 1936 C.D. 206.

Where the claim states that the aeration and agitation is "sufficient to form at said free surface a froth layer containing substantially all of said contaminants", it is considered to be functional, in accordance with the ruling laid down in General Electric Company v. Wabash Appliance Corporation 491 O.G. 463.

The claim is also not seen to involve any invention over the references as above applied to Claim 33.

Claim 42 is substantially identical with Claim 41, being merely a rephrasing of the same subject matter and is considered to be unpatentable for the same reasons as Claim 41.

Claim 43 similarly is rejected for the same reasons as Claim 41, this claim merely adding the unpatentable limitation that contaminated liquid is added to the volume being treated at substantially the same rate as the clarified liquid is withdrawn.

Respectfully submitted,

E. L. Sheffield,
Examiner, Division 49.

Mailed Feb 5 1948
Appeal No. 11,585
Hearing: June 13, 1947

Paper No. 21
RTM

U. S. PATENT OFFICE BOARD OF APPEALS IN THE UNITED STATES PATENT OFFICE

BEFORE THE BOARD OF APPEALS

Ex parte Robert Ben Booth and Norman Morash

Application for Patent filed May 20, 1942, Serial No. 443,816. Method for Clarifying Lubricating and Cooling Emulsions.

Mr. Elmer W. Harmon for applicants.

This is an appeal from the final rejection under Dual Prosecution by Division 25 of claims 33, 36, 41, 42, and 43 and by Division 49 of claims 35, 39, and 40. Claims 34, 37 and 38 were indicated by the Examiner as allowable.

Of the claims on appeal, claims 33 and 39 are illustrative and are copied below:

33. The process of clarifying a used, oil-in-water, emulsion-type, lubricating coolant contaminated by solid particles, without appreciably altering the physical properties of the original coolant, which comprises the steps of simultaneously subjecting a volume of said used coolant to aeration and intense agitation in the absence of added reagents, whereby a froth layer is formed at the surface of said coolant volume and substantially all said contaminants are concentrated in said froth layer as it forms; removing the contaminant-bearing froth from said froth layer and recovering the so clarified coolant.

39. The process of continuously clarifying a used, water-in-oil, emulsion-type, lubricating coolant contaminated by solid particles which vary widely in size and degree of agglomeration, without appreciably altering the physical properties of the original coolant, which comprises the steps of subjecting the contaminated coolant to settling for only a sufficient time to remove those larger and agglomerated contaminants of sufficient mass to be unamenable to froth flotation, collecting the settled contaminants, subjecting the coolant and the residual contaminants therein simultaneously to aeration and intense agitation in the absence of reagents whereby a froth layer is formed at surface of said coolant and substantially all the residual contaminants are concentrated in said froth layer as it forms, removing the contaminant-bearing froth and recovering the clarified coolant.

The references relied upon are:

Sulman et al 835,120 Nov. 6, 1906
Brown 1,455,187 May 15, 1923
Karlstrom 1,717,223 June 11, 1929
Munro 1,937,837 Dec. 5, 1933
Booth 2,153,449 Apr. 4, 1939
Karlstrom 2,248,177 July 8, 1941

The contended invention is broadly presented as the separation of the solid particle contaminants from used, oil-in-water, emulsion type "lubricant coolants" by froth flotation cell, such as the Fagergren, without the use of an added flotation agent. The quoted expression is used in the art to designate the liquid used both to abstract heat and to lubricate the tool in machine-forming operations. The particular type of lubricant specified in the claims is used in metal shaping operations and the solid contaminants are therefore of a metallic or metal oxide nature. In the flotation cell used the solid-containing liquid is subjected to simultaneous aeration and mechanical agitation with the result that solids are floated off and removed with the froth, and the residual liquid is removed as underflow. The withdrawal of froth and solids, the underflow of separated liquid, and the inflow of liquid to be treated are continuous. The emulsion-type lubricant coolant treated by appellants is made up by mixing water with light oil solutions of various other lubricants and additants such as fatty oil soaps, wetting agents, etc., with the apparent effect that a stable emulsion is formed. With such a liquid the use of added flotation agents has been found unnecessary. Some claims contain the preliminary step of removing the larger-sized particles by settling.

The state of the art as shown by the patents cited by the Examiners before whom the case was prosecuted under dual prosecution is in large part acknowledged by appellants in the specification. The patent to Brown discloses a method and apparatus for removing solid particles from oil-in-water, emulsion type lubricant coolants in which the larger particles are removed by settling and the finer particles by centrifuging. The use of flotation procedure involving aeration and mechanical agitation for clarifying "white water" of the paper industry by floating off the fiber particles without the use of a flotation agent is disclosed by the Karlstrom patents. A patent to the co-inventor Booth discloses the use of flotation in the same cell here described, the Fagergren cell, for the purification of spinning baths used in the formation of thread from viscose. These baths become fouled with free sulphur which is floated by the treatment. The patent to Sulman discloses the selective flotation in ores of metal values from gangue by the use of fatty acids or fatty acid soaps as flotation agents. Munro shows the combination of classification and flotation applied to ores with suitable flotation agents such as oils, etc.

Claim 33 has been rejected by the Examiner on the ground that the use of the apparatus shown by Karlstrom or Sulman for appellants' purpose and on appellants' liquid does not amount to invention. We note the Examiner's allowance of claim 34 which differs from claim 33 only in stating that the coolant is simultaneously subjected to "aeration and intense mechanical agitation", rather than merely to "aeration and intense agitation". In view of the selection of a known flotation cell to carry out the process, we consider that the real issue presented is the question of invention involved in broad use of flotation without the use of flotation agents in separating the contaminating solids from the particular liquid here clarified and that allowance of any claims in the application depends upon finding invention involved in such proposition.

We find, however, that the disclosures of Sulman and Munro of the use of oils or fatty acid soaps to effect the flotation of mineral values from gangue is suggestive of the lack of necessity for the use of an additional flotation agent here, since oils and fatty acid soaps are components of the coolant and since the particles floated are metallic. We further find that the co-inventor Booth in disclosing the use of flotation in purifying spinning baths states:

> "The question whether a reagent should be used is largely one of economics because while the process without reagents gives good recovery and good clarification, this is obtained at the expense of lower flotation machine capacity."

and further indicates the general principle that flotation can be obtained for certain solids even in the absence of any substance, like the oil or fatty acid soaps of emulsion-type coolants, that are considered flotation agents. We are of the opinion therefore that the above, together with the Karlstrom patents as a further indication of the use of the flotation principle for other materials or liquids than on ores negatives invention in appellants' application of the flotation principle and use of a known flotation cell in the clarification of the oil-in-water type of lubricant coolant. We likewise consider that the preliminary step of settling larger sized particles stated in claims 39 and 40 involve no invention, in view of the above state of the art, over the patent to Brown.

We therefore hold claim 34, as well as claims 33, 36, and 39 through 43, now standing as rejected by the Examiners, unpatentable over the Brown patent in view of the state of the art as discussed above. Karlstrom and Booth are equivalent in showing the extension of the flotation principle outside of the ore treating field. Sulman, Booth and Munro are equivalent in showing the lack of invention in recognizing that the solids may be floated without the addition of flotation agents in view of the presence of a component known as having such function. As to claims 33, 34, 36, 41, 42 and 43, we find sufficient reason for rejection on Karlstrom or Booth alone in view of the patents to Sulman, Munro or Booth evidencing that there can be no question of unexpectedness or surprise in the recognition of the claimed solution of the problem in separating a particular liquid from the solid contaminants by flotation, whether or not a flotation agent is used.

We fail to see any further invention over claim 34 in the steps stated in claim 37 of permitting the froth "to collapse" and of returning under flow of relatively clean coolant to the flotation cell. Obviously, the froth must eventually "collapse" and no utility is apparent in returning the underflow, unless for the obvious reason of further submitting to the flotation treatment to lower the solid content. Claim 38 adds the idea of continuous operation to the method of claim 34 and can involve no further inventive concept.

We agree with the Examiner in the rejection of claim 35 as directed to a non-elected species.

We regard the objections to claim 41 on the grounds of indefiniteness and functionality as material only if some distinction over the art, which is not apparent, can be contended as resulting from use of the particular words: "establishing", "subjecting", and "sufficient to form at said free surface a froth layer containing substantially all of said contaminants". We believe that such grounds are applicable only if they materially effect or characterize the essential and inventive steps.

Since we have held allowed claims 34, 37, and 38 unpatentable and since our reasons for rejection of the remaining claims involve a somewhat different consideration from that set forth in the Examiners' Statements, procedure is open to the appellants under Rule 139.

The decisions of the Examiners are affirmed.

In event of appeal, attention is directed to In re Boyce, 32 CCPA 718; 144 Fed. (2d) 896; 1944 C. D. 609; 568 O. G. 568; 63 USPQ 80 in regard to specifically including in the appeal notice *all* grounds of rejection in the Examiner's Statement not expressly overruled by the Board.
February 5, 1948

/s/ E. F. Klinge
Examiner-in-Chief
/s/ E. W. Geniesse
Examiner-in-Chief
/s/ P. W. Shepard
Examiner-in-Chief
(Acting)
Board of Appeals

Mr. Elmer W. Harmon
1937 West Main Street,
Stamford, Connecticut

Paper No. 23

Mailed Mar 22 1948 U. S. Patent Office Board of Appeals

Appeal No. 11,585 RTM

IN THE UNITED STATES PATENT OFFICE

BEFORE THE BOARD OF APPEALS

Ex parte Robert Ben Booth and Norman Morash

Application for Patent filed May 20, 1942, Serial No. 443,816. Method for Clarifying Lubricating and Cooling Emulsions.

Mr. Elmer W. Harmon for applicants.

On Petition for Reconsideration

Appellants request reconsideration of our decision of February 5, 1948 on their appeal from the Examiners' final rejection. They contend that we erred as a matter of law in not restricting our consideration to the points raised by the Examiners and in passing upon the patentability of unrejected claims on the art of record and upon aspects of the case not raised by the Examiners, as well as in matters of fact in regard to our conclusions. We noted that our decision was made under the provisions of Rule 139. Appellants have elected to have us make a new decision upon the present record, rather than reopen the case before the Examiners after amendment or further showing of fact, as provided for by the Rule. They have presented further argument traversing our conclusions in regard to our interpretation of the references and the questions of invention involved.

We do not see how Rule 139 can be interpreted otherwise than as authorizing the Board of Appeals in their decision to state grounds not involved in the appeal for "refusing letters patent in the form claimed or in any other form," and for specifically holding that such grounds render allowed claims unpatentable. We do not think that the Rule is inconsistent with the statutes to which appellants call attention.

We have reconsidered our decision as to the points of law involved in accordance with appellants' request, but see no reason for altering the procedure we have adopted or for restricting our decision to the claims and specific grounds treated in the Examiners' Statements.

We note that appellants have filed an accompanying petition to the Commissioner of Patent in anticipation of our refusal to alter our conclusions as to the points of law involved. We will hold our new decision under Rule 139 in abeyance, pending disposal of said petition.

March 22, 1948

/s/ E. F. Klinge
Examiner-in-Chief
/s/ E. W. Geniesse
Examiner-in-Chief
/s/ P. W. Shepard
Examiner-in-Chief
(Acting)
Board of Appeals

Mr. Elmer W. Harmon
1937 West Main Street,
Stamford, Connecticut

Paper No. 25

Mailed Apr 14 1948 U. S. Patent Office Board of Appeals

Appeal No. 11,585 RTM

IN THE UNITED STATES PATENT OFFICE

BEFORE THE BOARD OF APPEALS

Ex parte Robert Ben Booth and Norman Morash

Application for Patent filed May 20, 1942, Serial No. 443,816. Method for Clarifying Lubricating and Cooling Emulsions.

Mr. Elmer W. Harmon for applicants.

On Petition for Reconsideration

Appellants waived their right of reopening prosecution of their application before the Examiners under Rule 139, and request reconsideration of our decision of February 5, 1948, specifically at least of claims 34, 37, and 38 which had been allowed by the Examiners, and of claim 40. They have withdrawn the appeal as to claims 33, 35, 36, 39, 41, 42 and 43, noting that they have done so for the purpose of simplification because it is their intent to have the words "intense mechanical agitation" as in claim 34 construed as "intense physical agitation", which construction they state makes the withdrawn claims redundant. We further note, however, the contention of the final page of the request that withdrawn claim 35 should be allowed and that no amendment cancelling the claims withdrawn accompanies the request.

This is a decision, therefore, as provided by the Rule under the option exercised by the appellants. We have reviewed our holding that claims 34, 37, and 38 allowed by the Examiner are unpatentable over cited art, as well as our decision in regard to the other finally rejected claims, including claims 35 and 40 in the light of appellants' arguments, but find that we can reach no other conclusions. No sufficient justification has been advanced, nor can we discover any sufficient reason for now finding that the above claims are patentable.

Appellants urge that the dirt, sludge, and grit content accumulating in lubricating and cooling emulsions present a problem of froth flotation separation that renders the methods described by the various cited patents for the flotation and separation of solids from liquid mixtures non-analogous. They likewise minimize the distinctive effect of the limitation "in the absence of added reagents" of the retained claims, contending that the claims are allowable without its inclusion.

While the claims are not limited as to the character of the contaminants and would include the process applied to a lubricant-coolant emulsion which contained no other than contaminants having metallic components, the contention emphasizes the non-selective action of the froth flotation as a compelling factor for holding the process at issue patentable over the selective flotation processes for mineral separation and ore dressing and over the application of the flotation idea in other purification or separation procedures. Selective flotation implies the separation of one solid component from another in a liquid mixture. Appellants' contentions in this respect have been fully considered, but we do not find them convincing. In the development of the art as represented by the cited patents, we can only conclude, in the absence of contrary showing in a specific instance, that it would be more logical to expect a flotation agent that had not been specifically developed for selective action to have a general flotation effect, rather than a selective effect. The selective action would appear to depend upon a number of factors which would have to be investigated. It would therefore appear to us to present more likelihood of invention to discover a selective flotation separation previously unknown, than to find the general susceptibility to froth flotation of all solids in a mixture, or to find that a flotation agent selective as to certain solids was not selective in general as to other solids.

It still appears to us that the necessity of modifying the usual mechanical details of froth separation processes or apparatus in adapting the idea to the separation of solids from liquid mixtures not previously separated by flotation is no indication of the inventiveness of effecting the froth flotation of a substance, previously separated by other methods in a well known froth flotation machine according to generally used flotation methods. We cannot concede that the specific difference in operating details denies analogy of the broad concept of using the idea of flotation for other solids that have previously been separated by other separation methods. We note appellants' comment on the fact that the Booth patent describes a process in which there is a flotation agent in the spinning baths purified, namely, xanthate, as an original constituent of the liquor, but further note that in the patented process no additional reagent is added. We again find no patentable distinction in the limitation of the claims to the absence of an added reagent, but regard the lack of invention as fully demonstrated by the cited art, were such limitation not present. We can see no element of surprise in discovering that the solids can be froth-floated from a liquid mixture already containing the frothers and flotation agents likely to effect such flotation in well known flotation apparatus.

We therefore hold it no invention to substitute the froth flotation procedure of Booth (2,153,449) for the centrifuging procedure of Brown in separating the contaminants from lubricating coolants as stated in claim 34. We regard this claim as unpatentable over this combination of references and again note the other art discussed in our prior decision as cumulatively demonstrating the use of the flotation idea outside of the ore treating field and as showing the flotation assisting properties of the components of applicants' lubricating-coolant emulsion.

We again find no invention in the added steps of claim 37 of permitting the froth "to collapse" and of returning underflow decanted from relatively clean coolant to the flotation cell for further treatment. We note a decanting operation in Brown preliminary to the centrifugal separation and see no invention in repeating the operation after a purification in accordance with Booth. We see no further invention in the statement of claim 38 of making the operation continuous. We regard the steps as stated as the obvious operation of the well known Fagergren cell.

We adhere to the rejection of claim 40 as defining no invention in combining the preliminary settling step shown by Brown with the steps of claim 34 and in expressing the continuous operation of the process.

We again affirm the Examiner in the rejection of claim 35 as directed to a non-elected species of his general process. We likewise would repeat the rejection of the finally rejected claims that we understand appellants have withdrawn from appeal, namely, claims 33, 35, 36, 39 and 41-43.

Claims 34, 37, 38, and 40, as to which appellants request reconsideration, stand rejected for reasons stated in our prior decision and more fully discussed above.

The petition has been considered but is denied in respect to making any change in our decision.

April 14, 1948

/s/ E. F. Klinge
Examiner-in-Chief
/s/ E. W. Geniesse
Examiner-in-Chief
/s/ P. W. Shepard
Examiner-in-Chief
(Acting)
Board of Appeals

Mr. Elmer W. Harmon
1937 West Main Street,
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No. 11,093

BRIEF FOR APPELLANT

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

United States Court of Appeals
For the District of Columbia Circuit
FILED SEP 27 [illegible]
CLERK

AMERICAN CYANAMID COMPANY,
Plaintiff-Appellant,

v.

JOHN A. MARZALL, Commissioner of Patents,
Defendant-Appellee.

Appeal from the Judgment of the District Court
for the District of Columbia

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No. 11,096

STATEMENT OF QUESTIONS PRESENTED

1. Whether a patent should not be granted for an accidentally discovered new process of treating certain complex materials by a particular processing technique yielding amazing unforeseeable new results involving unique phenomena, which solved a long standing industrial problem and became a commercial success; where references show various non-analogous uses of procedurally the same processing technique in unrelated fields, where the Patent Office and District Court ignored differences both in nature of materials and in results in the references, although the nature of the materials treated always determine the results of the particular processing technique, and where the tribunals below differed materially in their reasons for refusing a patent.

2. Whether certain claims of the application in suit are unpatentable for double patenting over a narrower claim in a patent granted to appellant on a later-filed copending application for an improvement on the process of the same inventorship.

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1. Where this Court on review of all pertinent facts and uncontroverted evidence regarding a claimed invention concludes that trial court's decision was clearly erroneous, this Court reverses 41

2. This Court should reverse and hold that upon the evidence, under the law applicable, the claimed process in suit is a new and patentable process, for a new use of the old manipulative steps of froth flotation in a new and non-analogous field, producing phenomenal new results which were entirely unforeseeable from prior knowledge, and satisfying a new and recognized want 42

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United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

NO. 11,096

AMERICAN CYANAMID COMPANY,
Plaintiff-Appellant,
v.
JOHN A. MARZALL, Commissioner of Patents,
Defendant-Appellee.

Appeal from the Judgment of the District Court for the District of Columbia

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BRIEF FOR APPELLANT

JURISDICTIONAL STATEMENT

This is an appeal under Title 28 U. S. C. A. sec. 1291 from a judgment of the District Court of the United States for the District of Columbia dismissing appellant's action under R. S. sec. 4915, 35 U. S. C. sec. 63, to authorize appellee to issue a patent to appellant.

Appellant's involved application is Serial number 443,816, filed May 20, 1942 by Robert B. Booth and Norman Morash for Method for Clarifying Lubricating and Cooling Emulsions. (A118)*

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* (A) refers to the accompanying Joint Appendix.

"Ex. Bk." refers to the Joint Exhibit Book of defense patents, six copies of which are filed herewith pursuant to leave granted by order of the Court.

Italics are ours throughout.

On April 14, 1948, the Patent Office Board of Appeals, on petition for reconsideration, rendered a decision (A156) adhering to its original decision (A148) of February 5, 1948 and refusing a patent on claims 33 through 43 (A132) of the application. The action was filed May 19, 1948 (A2). Trial was held in District Court on March 22 and March 23, 1950 (A24) and judgment of dismissal (A20) with findings and conclusions (A13) were entered about a year later on March 8, 1951, based upon an opinion holding no invention, handed down by the District Court December 14, 1950 (A13). The normal limit of appeal was sixty days thereafter under 28 U. S. C. sec. 2107, appellee being an officer of the United States. Neither party having been notified of the entry of judgment, the District Court on motion (A20) extended the time for appeal, under the authority of said statutory section, an additional thirty days, on May 21, 1951. Notice of Appeal was filed within the extended period on June 6, 1951 (A21).

STATEMENT OF THE CASE

Field of the Invention

The invention is directed to a new method or process of clarifying used lubricating and cooling emulsions of contaminating solid particles, with which they become contaminated in the course of normal usage, to render the emulsions suitable for reuse.

Lubricating and cooling emulsions are oil-in-water emulsion-type coolants, more conveniently referred to as emulsion coolants. They are extensively employed by many industries to provide lubricating and cooling at the working point of the operating tool with various metal or plastic materials being worked in power-driven machine tools, including cutting, milling, drilling and grinding machines (A25). The coolants are circulated from a supply tank, delivered as a stream at the working point, collected and circulated back to the supply tank for reuse.

Under repeated usage the emulsion coolants become contaminated with a complex mixture of various kinds of solid materials, including metal cuttings, coarse and fine metal particles, abrasive grit and organic grinding wheel binder from grinding tools, rust, scale and nondescript particles of dirt. Further contamination is caused by fatty-acid sludge created by break-down of components of the emulsion coolants from the heat at the working point (A26, 47). The size of these contaminants varies considerably varying from coarse cuttings down to particles having a size smaller than one micron. (A130)

The composition of the contaminants may vary according to the type of machine tool and material worked upon. Because of the different kinds of contaminants, both metal and non-metal, and because the composition varies, the complex mixture of contaminants in the coolant presents a complex problem of removing them and clarifying the coolants for reuse.*

Since the solid contaminants accumulate rather rapidly in the coolants under modern high speed tool operation the coolants must be thrown away and replaced after limited periods of use, sometimes a week or two, sometimes only two or three days (A27, 31), to prevent the contaminants from injuring the tool or work, unless the coolants can be clarified by removal of the contaminants.

Replacement with new coolants requires machine shutdown for from one-half hour to two hours time (A31) and is a substantial item of expense because of the cost of such materials and the large volumes, measured in terms of hundreds and thousands of gallons (A111), in which they must be employed (A31).

---

* Morash, in testimony in the trial court, brought out the further complicating factor that some contaminants tend to settle and others float (A45), and still others to remain in suspension (A47), in the coolants. See also Example 3 (A127).

The emulsion coolants are complex liquid mixtures of light oil solutions including various soaps, such as mahogany soap, fatty acid soaps, etc., various lubricants, wetting agents, anti-oxidants, thinners, etc. which are cut with water to provide emulsions containing a substantial number of liquid ingredients that may be accurately described as complex liquid mixtures because of the number and varying nature of their ingredients (A26, 131). Because oils and other lubricating ingredients tend to separate from water, their make-up must be such that the emulsions will not break down under working conditions.

The need for clarification of emulsion coolants to maintain them usable is evident. The problem of clarification is multifold. All of the complexity of different kinds of solid contaminants must be removed. But the liquid emulsion must not be broken, and none of the liquid ingredients of the emulsion coolants must be removed from the rest, else the composition of the emulsion would be changed. Clarification should be substantially complete since the presence of only a small quantity of contaminants may seriously injure a working tool or scratch or score and spoil an article being worked.

The Inventive Process

The inventive process involves the technique of froth flotation. This consists in subjecting a contaminated emulsion coolant to simultaneous, froth producing, aeration and agitation. Air is introduced into the coolant and rises to the top as a mass of fine air bubbles and a froth is continuously developed at the top of the coolant.

The manner of agitating the coolant may vary in form but must be of sufficient intensity to assure a high state of agitation in the coolant, a stream of air bubbles rising up through the coolant, and the development of a supernatant froth or foam layer of aerated coolant at the top of the liquid coolant. The solid contaminants in the coolant due to an induced attraction attach to rising fine air bubbles which carry them up into the froth layer at the top. The contaminated froth at the top of the liquid coolant and the now clarified coolant are separately removed.

Fig. 1 of the drawing of the involved application (A137A) illustrates a so-called Fagergren froth flotation cell, one type adapted to carry out the clarifying treatment. This includes an outer casing 1 enclosing three compartments 2, 3 and 4 which are separated from each other by means of partitions 5 and 6 and a false bottom 7. Chambers 2 and 3 are interconnected by a large opening 9. Immediately above opening 9 are a series of circumferentially spaced rods comprising the stator of the flotation unit. Rotable within the stator are a similar series of rods comprising a rotor 11 which is driven at relatively high speed by a shaft 12. Rotation of the shaft can be effected through any conventional driving mechanism. Mounted on the stator and surrounding shaft 12 is an air intake hood 14.

Contaminated coolant flows into the unit through inlet pipe 8, passes downwardly through chamber 2 and into chamber 3. Rotation of rotor 11 at high speeds of 350 to 2200 r.p.m. (A96) not only agitates the coolant intensely but draws air down through the annular space 13 between shaft 12 and hood 14, forcing it into the liquid as fine bubbles to which the solid contaminants attach. Under the combined agitation and aeration, a froth layer forms at the top of the coolant containing the solid contaminants. A rotary skimmer 15 continuously removes the froth over a tailgate 16 into a launder 17 from which it can be delivered to any desired point. Clarified coolant flows over partition 6 into chamber 4 and from thence flows out through a pipe 18.

As variously shown in Figs. 2 and 3 the flotation unit as just described may be arranged in a continuously operating circuit wherein contaminated coolant is continuously withdrawn from a grinding or other material modifying machine, continuously circulated to and clarified in the froth flotation unit and continuously recirculated back to the machine after clarification for reuse. The contaminant solids are continuously removed with the froth from the top of the clarified coolant.

The clarifying process may be carried out with pneumatic and other types of froth flotation units in addition to the described mechanical unit. (A124)

The process may embody one or more collateral steps, such as preliminarily conducting it through a settling tank (Fig. 3) adapted to remove coarse solid contaminants which can be easily settled. This and other collateral steps are included in some of the claims of the application, as hereafter pointed out.

As further pointed out in the application many cutting oil emulsions are of a composition adapting them to cause the air bubbles to float all the solids without the addition of reagents. Other emulsion coollants may have some deficiency in composition and require the addition of reagents to promote the affinity of the solid contaminants for the air bubbles and/or frothing reagents to promote formation of a froth (A121).

The six examples in the application illustrate the operation of the process with emulsion coolants containing various types of solid contaminants and indicate various collateral treatments in some cases.

Froth flotation is a new technique in the field of emulsion coolants. It is an old technique in a few other fields, but there is employed under entirely different conditions and for different purposes which would not suggest the adaptability of the technique to emulsion coolant clarification, as will hereafter be clearly shown.

The present process of clarifying emulsion coolants by froth flotation involves the following novel features in the use of froth flotation technique:

1. The emulsion coolants are substantially completely clarified of their mixed contaminating solids, including those of a nature which would not be expected to be flotable. The amount of solids removed will run 99.9% or better. (A126-132)
2. Mixed solid contaminants are removed non-selectively as a mass, and all about 100%, from the emulsion coolants. This is a unique and amazing phenomenon.
3. The original physical state of the emulsion coolants is maintained. They are not broken down or partially separated. None of their liquid constituents are removed.
4. The solids are removed from an emulsion of mixed liquids and none of the individual liquid is removed instead of, or in addition to, the solids.
5. Mixed solids are removed non-selectively as a mass from a complex mixture of liquids without removal of any of the individual liquids.
6. No one before has floated solids in an emulsion. In fact, it is known that various emulsions break down and separate under froth flotation.
7. No liquid vehicle was known, prior to emulsion coolants, having the properties of effecting substantially 100% solid flotation out of a liquid and, effecting it with mixed solids of different kinds.

The process, also, has the following features which are new in the field of emulsion coolant clarification:

1. The process has the capacity to clarify the entire volume of emulsion coolants from one or more grind-

ing or other material working machines and to return the coolants after clarification with continuous operation.

2. The process is the first to enable emulsion coolant clarifying systems to operate continuously for prolonged periods without shutdown and delays for cleaning.

3. The process is the first providing for continuous discharge of contaminating solids as fast as recovered from the coolant so that there is no deposit of solids and the equipment employed will be self-cleaning and adapted to indefinite operation.

The Claims in Suit

Claims 22 through 43 (A132) are in suit. Claim 33 may be taken as typical. In sectional form, it reads as follows:

> "33. The process of clarifying a used, oil-in-water, emulsion-type, lubricating coolant contaminated by solid particles without appreciably altering the physical properties of the original coolant which comprises the steps of simultaneously subjecting a volume of said used coolant to aeration and intense agitation in the absence of added reagents whereby a froth layer is formed at the surface of said coolant volume and substantially all said contaminants are concentrated in said froth layer as it forms; removing the contaminant-bearing froth from said layer and recovering the so clarified coolant."

Claims 33 through 43 all define in common and in unambiguous language the essential features of the process, which include:

(a) the coolant treated is of the oil-in-water, emulsion type;
(b) clarification is effected by simultaneous aeration and agitation (froth flotation);
(c) the solid contaminants are concentrated in the froth layer and removed therewith; and
(d) the physical properties of the coolant are not appreciably altered.

Claims 34, 37 and 38 require the use of mechanical agitation, the preferred type for froth flotation. The other claims are broader to comprehend the use of pneumatic agitation and other types of agitation which the application points out (A121) will also serve in conjunction with aeration to remove substantially all of the contaminants with the froth.

Claims 36, 38, 39, 40 and 43 specify a continuously operating process, and in such group claims 38, 40 and 43 further point out that this includes the continuous removal of clarified coolant from the coolant volume undergoing processing, the continuous addition of contaminated coolant at substantially the same rate and the continuous removal of contaminant-bearing froth at substantially the rate at which the froth forms. This group of claims emphasizes the adaptability of the process to uninterrupted operation in a continuous clarifying circuit of a grinding or other material modifying machine while the other claims also comprehend batch treatment.

Claims 33, 34 and claims 36 through 40 specify that clarification is accomplished in the absence of added reagents, which can be accomplished with many emulsion coolants. The practice of froth flotation in treating materials in other fields ordinarily requires the use of one or more reagents, such as flotation agents, frothing agents or other agents adapted to assist in carrying out a successful treatment. Claim 35 and claims 41 through 43 comprehend the use of added reagents, which some particular contaminated emulsion coolants may require.

Claims 41 through 43 specify the treatment of emulsion coolants contaminated by metallic and other solid particles. They are important in that while the process is useful in the treatment of coolants contaminated entirely by non-metallic solid particles, as where pieces of plastic type material are being worked by a modifying machine, the process is widely used in conjunction with modifying machines which work metal.

Four of the claims include various auxiliary steps which may be employed where conditions require or make them Claims 39 and 40 call for a preliminary step of settling out any larger and agglomerated contaminants which are not amenable to froth flotation. The presence or absence of such coarser particles is determined by what type material modifying machine a contaminated coolant comes from. Claim 37 calls for the treatment of the contaminated froth to recover coolant therefrom and the return of such coolant for further froth flotation treatment. This is an economy step to reduce losses of coolant. Claim 35 is particularly concerned with the clarification of coolants cantaminated by magnetically susceptible solids, such as steel particles, and calls for the preliminary removal of such particles by magnetic force. These various auxiliary steps are illustrated in Fig. 3.

Inventive Process Involves Unique Phenomena and Yields New Results Entirely Unforeseeable from Prior Froth Flotation Knowledge.

Five witnesses at the trial below expressed their amazement at the complete clarification of coolant emulsions of all mixed contaminated solids by froth flotation. The inventors Booth (A72) and Morash (A46), both experts in the field of froth flotation, were completely amazed at what they had accomplished.* Similar amazement was expressed by Falconer, an expert in froth flotation of twenty-five years experience (A104). Bullard, an engineer in the machine tool field (A25), tried the process out under actual working conditions on a machine tool

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*** The inventors were not attempting to mass float all mixed solids at the time of their original work (post. pp. 16-19).**

in the plant of the Bullard Company and stated that both he and all the plant personnel were very much amazed at the successful manner in which the invention operated under actual working conditions (A33). Falconer made the following significant statement (A104-105):

> "Q. Where is the recovery with respect to location? Is it at the bottom or top or both? A. Recovery is made in this process at the top, and the amazing thing is that it is all at the top.
> Q. Do you feel from your experience in froth flotation that you qualify as an expert in that field of froth flotation? A. I do.
> Q. Do you make that statement you have just made, that it is surprising to get all of the dirt off of these coolants at the top, as an expert? A. I do. It is a most unusual thing, and in fact I don't know of any flotation operation in mineral dressing where complete recovery is obtained.
>
> In mineral dressing with froth flotation we are separating one solid from another and even under ideal conditions the recovery is never 100 percent complete."

Bennett, engaged in selling filter devices for the same purpose (A60) was so impressed when he first saw the process operate that he immediately sought a license for his company (A67).

There are a number of well-known facts about froth flotation which explain clearly and fully why emulsion coolant clarification involves a number of unique and unexpected phenomena.

Aeration and agitation alone will not produce froth flotation of any of the metal and non-metal solids such as present as contaminants in coolants. The air bubbles themselves do not have the attractive power to float the solids. There must be present something in a liquid, whether inherent or provided by an addition reagent to induce attraction or affinity, one for the other, of the solids and air bubbles.

Various materials of oily nature are known which will produce froth flotation recovery of solid material in particle form. But the only flotation reagents of this nature known prior to the invention were selective in their action. Such material is selectively raised with the froth and other types of materials are not affected but settle at the bottom of the liquid. Morash explained a typical mineral separation by froth flotation employing added oily liquid (fatty acid) and pointed out that the process involved was the selective separation in a liquid of one solid from another (A40-42).

Moreover, it was the general experience in the prior art that 100 percent recovery is never obtained of even a single solid by froth flotation. Falconer points this out in his statement just quoted. This is verified in several of the defense patents collaterally relied upon by appellee. See Sulman et al patent 835,120 (Ex. Bk., 1-I, Ibid. p. 1, lines 32-35, 61-69) and Callow (Ex. Bk. 1-E, Ibid. p. 1, lines 51, 52, 72-76). Appellant maintains a special mineral dressing laboratory wherein Booth (A71) and Morash (A39) are employed for research on problems in this connection. Booth testified that the problem is to find a flotation agent which will do the best job with each particular mineral ore and the different ores require different agents to achieve a good recovery of the metalliferous matter therein (A86, 87).

Another important fact about froth flotation is that the presence of acids tends to cause non-metallic solid matter to settle rather than to float. The Sulman et al patent, (supra) page 1, lines 36-44, points out that a small quantity of sulphuric acid or other acid, not over one percent, may be employed to prevent coating of the material which it is not desired to float (the gangue) but warns that higher concentration of acids will react with metalliferous material. Falconer testified that if the mixed solid contaminants such as are present in emulsion coolants were placed in a liquid of ten percent sulphuric acid strong concentration the metals would be dissolved (A106) and the other solids would settle. He further points to the fact that in many mineral dressing operations acids are used as settling reagents (A106). Significantly, also Booth testified (A101): "If you added acid to a coolant you would wreck it."

It is important to state further that froth flotation is widely used in the mineral dressing field but is hardly known outside of such field, and the record herein so indicates. The Sulman et al patent (supra) granted in 1906 is the pioneer patent on froth flotation and it is concerned solely with the selective recovery by froth flotation of metalliferous matter. The patent was sustained by the Supreme Court in *Mineral Separations, Ltd. v. Hyde,* 242 U. S. 261, on the ground that it was invention to discover that adding a very small quantity of an oil, not over one percent, both induced the formation of froth and effected selective flotation of the metalliferous matter.

The Court is respectfully asked to read *Mineral Separations, Ltd.* v. *Hyde,* supra, in detail. There is a wealth of explanation in the case about the normal selective recovery characteristic of froth flotation and it confirms many of the points herein previously explained.

A comparative demonstration of a Fagergren froth flotation unit and its selective recovery of metalliferous matter from minerals and its non-selective mass recovery from an emulsion coolant of both metal and non-metal materials, including abrasive grit and dirt, was made before the trial court (A59, 60). It is added in the same connection that there is no discrimination in coolant clarification between various non-metal solids. In the commercial central clarifying installation embodying the inventive process at Bullard Machine Company the used coolant from a whole series of grinding machines working having a common coolant supply was clarified successfully under regular plant operation (A30). Various machines were operating on different types of materials, including plastics (A28).

As commonly employed in the clarification of coolant emulsions in connection with grinding machines operating upon metals, the inventive process appears to present a paradox. A selective recovery would be expected by any expert or other worker in froth flotation because, first, of the close relationship between the mixed metal and non-metal solid contaminants in the coolants and the metal and non-metal solids in the minerals separation process. The abrasive grit is of siliceous nature (A106) and together with the dirt generally corresponds to the mineral and non-mineral solids in the gangue which is settled in the mineral separation process. Secondly, and of equal importance, the emulsion coolants containing these solids are oiling in nature. Oils are added in common mineral flotation practice to produce a selective recovery of a metal in accordance with the Sulman et al patent (supra). According to the prior state of knowledge the inventive process should have produced selective separation, and that is what the inventors expected, that some material would float and some would not (A72). Nowhere in the prior art is there a precedent of an oil-containing liquid composition, with or without addition reagents which would mass float all the different types of materials which are present as contaminants in emulsion coolants.

Of course emulsion coolants contain various oils and soaps which the inventors and anyone who is skilled in the art would expect to produce froth flotation of some solid contaminant in the coolants but it is again emphasized that previously there was no known oily liquid, nor any oil or soap flotation reagent, or combination thereof which could be added to liquids, whereby selective mass recovery of different kinds of mixed solids by froth flotation would be obtained, much less provide 100% recovery.

A further surprising and paradoxical feature of the invention is that the emulsion coolants are not broken down and separated into component liquids by froth flotation. Booth testified that before the invention he had used froth flotation to break emulsions and that he was surprised in the initial work with Morash on the invention that the coolant did not break down (A72, 73). Falconer, who was also familiar with commercial uses of froth flotation for breaking emulsions, likewise regarded the stability of emulsion coolants under froth flotation as surprising (A105). Booth was so convinced that the emulsion coolant should break down that following the initial work on the invention many later tests by Booth and others were conducted to check the composition of various emulsion coolants both before and after froth flotation treatment before Booth was satisfied that the emulsion coolants remained stable (A73, 74).

Booth and Falconer were familiar with the fact that froth flotation is employed as a liquid from liquid separation process in recovering wool fat from wool scouring solutions wherein the solutions are at elevated temperatures and the wool fat is in liquid state, and forms an emulsion with the solutions.

Commercial installations have been made employing froth flotation to break the fatty emulsion and float and remove the separated liquefied wool fat, thus clarifying the scouring solution. Both Booth (A73-76, 99-101) and Falconer (A105) had had experience in this further field of use of froth flotation. Reference was made as disclosing such process in this field and for the separation of emulsions generally to a Broadbridge patent (1,505,944). This is not a defense patent or in the record in this action, but pertinent portions thereof are in the record (131) which explain froth flotation and what happens. Booth called attention to the following statement in the Broadbridge patent (A76):

> "The invention has been found specially advantageous in the treatment of certain obstinate emulsions, the constituents of which have presented great difficulty of separation."

Obviously this prior use of froth flotation to break and separate emulsion is a positive indication of the apparent unsuitability of froth flotation for a non-separating treatment of emulsion type materials. It points to the fact that the treatment of complex coolant emulsions by the inventive process without breaking and removal of liquid constituents involves a unique and entirely unforeseeable phenomenon in the behaviour of emulsions under froth flotation.

For all of the reasons herein pointed out the clarification of emulsion coolants by froth flotation of mixed solid contaminants and with the emulsion not breaking stands as an entirely unique operation. It involves multiple unique phenomena. Finding of Fact 17 (A18) that it involves no unusual phenomena and provides no unusual results is clearly contrary to the evidence.

Invention Originated in an Amazing Accident—An Experiment Seeking Clarification by Settling Went "Wrong."

The Supreme Court pointed out in *Mineral Separation, Ltd.* v. *Hyde*, supra, at p. 267, that the process of selective metal recovery by froth flotation of the Sulman et al Patent 835,130 was accidentally developed while the inventors were engaged in experiments having the directly contrary purpose of making the metal settle at the bottom of a liquid vehicle.

The development of the present inventive process provides an interesting parallel. Booth and Morash were engaged in experimental work seeking to *mass settle* all the contaminating solids in emulsion coolants.

The relevant testimony of the inventors' (A42-52, 71-74, 88, 89) clearly tells the story of how they came to try froth flotation. The following excerpts from such testimony fully explain why as experts they did so, when as experts they had all the prior knowledge regarding froth flotation reviewed in the preceding section of this brief—knowledge which should convince any expert in the field that froth flotation was entirely unsuitable for clarification of emulsion coolants and explains their utter surprise at the results:*

> "Q. When you secured that coolant you thought of treating it by a froth flotation process step? A. The problem as presented to me was presented in this way. I was requested to find a settling agent which could be added to the oil to make the materials, the dirt, settle to the bottom. In our laboratory we do work on both settling agents and froth flotation and flotation reagents. We did the work on the settling first and the flotation work came later." Booth A98

* * * *

> "Q. How did you happen to evolve this invention with Dr. Booth? Will you state it very briefly? A We were approached by a company which makes water-soluble oils and told that the machine tool industry had a problem of cleaning these oils or get-

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* The stimulus for the settling work was that settling tanks were in commercial use for coolant clarification with machine tools (A36) and had proved troublesome because, *inter alia,* parts of the contaminants would not settle (A47).

ting them in a proper reusable condition, and they asked us if we could, in line with our mining experience, develop a chemical reagent, a settling reagent, which they could add to their oil so that it would cause all of the dirt to settle out so that the coolant could be returned clean to the grinder." Morash A42, 43

* * * *

"Q. You say you took these emulsion oils— A. (Interposing) They brought into us three different samples. One was the straight oil which they market.
Q. Was that an emulsion? A. That is material which when added to water forms the emulsion.
Q. Was that the oil and lubricant? A. That is right; they are called water-soluble and they brought in a sample of that; they brought in a sample of the sludge which one can recover from a grinding operation; and then they brought in a sample of dirty coolant and they asked us to work with those to see if we could develop some sort of a chemical reagent which could be added to make the material settle."
"Q. Did they ask you anything about trying to make them float? A. No, they were after a chemical reagent which they could sell in their oil. That was their idea, to make a chemical which they could sell." Morash A44

* * * *

"THE WITNESS: That is right. We took that sample into the laboratory and as is the general custom, when you get a sample of material you first play around with it to get the feel of it; you want to know just what it does, and all—
BY MR. PARRY: Q. (Interposing) This was the sample of the oil? A. The dirty coolant.
Q. Oh, the dirty coolant? A. We took that sample and poured it into several graduated cylinders. As I remember it they were probably 1000 cc. graduated cylinders, and one we kept as a bank—
Q. (Interposing) Who is we? A. Dr. Booth and myself. Another one we added say settling reagent A; to another one settling reagent B which we knew

had worked as a setlting reagent in the ore dressing field, and tried them out. *The bank, we noticed, when we would take that and shake it up that some of the contaminants would go to the top of the bottle and some would stay down at the bottom. Then that impressed us and we said why can't we take this and put it into a flotation machine and see if we can remove that material that goes to the top so easily, and then we could afterwards pass the other material that was on the bottom out and maybe settle it out.* So we took a sample of it, and put it into a laboratory flotation machine." Morash A45

* * * *

"Q. And what happened? A. *We dumped the sample into the machine, agitated it for a moment and allowed the air to come in and then the amazing thing happened which was that everything 'poufed', like that, came up to the top of the liquid.*

Q. By 'everything' you mean what?

A. All of the solids that were present.

THE COURT: You mean not only the solids that were on top in the bank but the solids that were on the bottom?

THE WITNESS: That is right; everything came up; and *that was really amazing because in the light of our mining experience we expect to look down at the bottom and see a lot of material down at the bottom.* We skimmed that off with a hand paddle, and at first we just got what is known as a sort of dead float; when this stuff came up in such a hurry it formed a thick layer on top and we skimmed that off and we noticed as we were getting most of it off then we started to get a very lively bubble back in the unit, bubbing very effervescently. Then we shut down the machine because we couldnt believe it would work like that, and drained the sample out of the bottom and looked at it and we could find no solids in it. So then we took it over to the laboratory bench and poured it through a filter, a Buchner suction filter and we found there were no solids remaining on the filter paper, and that therefore *we had, rather than just obtaining a separation of the two, what we had done was to float everything.*

Q. Just to make one point clear, do I understand what you speak of as the dirt in this coolant of the sample given you was a mixed dirt? A. That is right.
Q. Could you identify what was in it? A. It was material that had come off a grinding machine which contained the metal particles due to grinding; grinding grit from the wheel and some organic binder which is used in order to hold the wheel together. Morash A46, 47

* * * *

"Q. Dr. Booth, concerning the development of this invention, I want to ask you, as I did Mr. Morash yesterday, when you took any of the materials in these jars containing these dirty coolants that had been received from some company, and you put a settling agent in them, and some solids appeared at the top and some at the bottom, and you and Mr. Morash decided to try froth flotation, what did you expect to get? A. *Based on my experience in the field of mineral dressing, or ore flotation, I expected some of the material would float and that some would remain in the flotation cell.*
Q. Did you expect to get all of the solids coming off at the top? A. No.
Q. Was that surprising to you? A. Yes.
Q. Do you state that on the basis of your experience as an expert in this field? A. I do." Booth A72

* * * *

Uncertain whether their initial experiment involved unreproducable laboratory phenomena, but sensing that they might have accomplished something of potential value, Booth and Morash carried out further work which completed and confirmed the successful practical adaptation of what they had accomplished.

They tested further samples of contaminated coolants obtained from new sources and assured themselves that clarification of mixed solids was a uniform result of treatment of emulsion coolant by froth flotation and upon inquiry of concerns in the machine tool field they were informed what they had accomplished concerned an existing problem (A51, 52).

Uncertain, also, whether their experimental work would provide a practical commercial process, they took a froth flotation unit into various machine tool plants and determined that coolant emulsions could be clarified under regular plant operation. Of particular importance, they determined that their flotation clarification had the capacity to handle the volume of contaminated coolants from machine tool in continuous circulating flow (A82). Repeated tests before referred to (supra p. 15) were made which confirmed the fact that the emulsion coolants remained stable and suitable for reuse.

The inventive process was thus evolved and proved practically workable. Their original aim of accomplishing clarification of the coolants by settling out all the contaminants had led them accidentally to a more valuable and beneficial invention.

Long Existing Need for the Invention

At the time the invention was developed in the fall of 1941 (A38), filters, centrifuges, and settling tanks for used emulsion coolant clarification were available on the market. None of them satisfactorily met machine tool plant requirements. This is abundantly clear from the testimony in the trial court of Bullard, research engineer for Bullard Machine Co. of Bridgeport, Connecticut, which operated various types of machine tools in the manufacture of many types of metal and plastic parts (A25, 28), from the testimony of Bennett, who for many year's sold filters for the purpose, first for the Bowser Co. (A64) and from 1942 to 1945 for U. S. Hoffman Machinery Corp. (A60, 61) and from further testimony of Booth and Morash.

Emulsion coolant clarification presents a difficult clarification problem because of the high volume of contaminants developed by machine tool operation (A64). This, is responsible for part of the difficulties experienced with the various prior clarifying techniques.

Filters are capable of removing substantially all of the solid contaminants from the coolants for a while but quickly clog up and require shutdown and cleaning of the filter system as frequently as every six or seven hours and in extreme cases oftener than every ½ hour (A61). Bennett summarizes the objection to filters by stating (A62):

> "Well, I don't know if I can enlarge on that greatly except to say that there was a definite resistance to the sale of that type of equipment because of the extreme amount of service required on cleaning them and the interruption of service of the machine tool or the coolant flow during the cleaning period."

He further testified (A61) that because of such limitation of filters there was only a rather limited acceptance of them by the machine tool industry. Bullard testified that his company had tested out several types of coolant filters at the Bullard Co. but rejected them as unsatisfactory to meet plant demands (A 31, 32).

Some machine tool plants used centrifugal clarifying systems for coolants. They are open to the serious objection that within practical size and cost limits they have the capacity to handle only a minor portion of contaminated coolants. In this connection Bennett testified (A65):

> "Well, they are primarily limited to by-pass systems. By that I mean with a flow rate of any given flow rate, the centrifuge would only handle a portion of that. Usually about 10 or 15 percent of the total flow involved would go through the centrifuge."

Morash described a central centrifuge clarifying installation at Norma-Hoffman Bearings Co. with a fair-sized centrifuge but observed that it would handle only 1/3 of the flow so that the major portion of the coolant had to be returned to the machine tools without clarification (A53, 54). Such centrifuge systems also were subject to the same objection as filters. The solid contaminants collected in the centrifuge and it had to be shut down for periodic cleaning (A96, 97). The Bullard Co. tested out a centrifuge system made by the DeLavall Co. and found it unsatisfactory to meet its requirements (A35).

Settling tanks have been commonly used for coolant clarification. They are intended to cause solid contaminants to settle downwardly to the bottom whereas under the inventive process the contaminating solids are recovered at the top of the coolant. Bennett (A65) pointed out that these were objectionable because of size, and Bullard stated that they required frequent shut down for cleaning (A29, 30) and did not clarify properly except for a short time (A36, 37). Morash observed (A47) that with most settling tanks some of the solids do not settle and remain in the coolant. He and Dr. Booth had been requested to develop a settling reagent to overcome this problem by a concern supplying oil used in emulsion coolants (A42, 43).

Mr. Bullard summarizes his objections to all these prior coolant clarifiers: (A32)

> "None of them had proved particularly satisfactory on actual test in our plant, primarily from the standpoint they were either too costly or the initial installation would have been so excessively costly and bulky or that the operating expense and problems involved with them, that is maintenance, cleaning at frequent intervals, would have been such *we didn't consider them a practical installation and accordingly we rejected any of those and did nothing about it.*"

Bullard stated that his company had made extensive investigation for some satisfactory means of clarification of coolants but continued to operate their machines without clarifying the contaminating coolants, even though this meant frequent throw away and replacement by new coolant (A31).

The common objection to all of the prior coolant clarifying techniques is that they deposit the contaminating solids in the clarifying units and such solids cannot be removed without shut down and cleaning. None of them are self-clarifying and none of them can operate for prolonged periods without shut down.

The present inventive process by which the contaminating solids can be continuously discharged with the froth from the top of a froth flotation clarifying unit as fast as the coolant is clarified and capable of continuously clarifying the full volume flow of coolants avoids all objections to the prior devices and provides the first practical solution for emulsion coolant clarification. The need for it had existed for many years (A65).

The Invention Satisfied the Need and Became a Revolutionary Commercial Success

Booth and Morash first presented their invention to Norma-Hoffman Machine Co. and Yale & Towne Manufacturing Co. At both plants they found a tremendous unsolved problem in emulsion coolant clarification. (A81)

Norma-Hoffman was making precision bearings and a centrifugal clarifying system in use there only partially clarified the coolant, so that the coolant was too dirty to give them good operation ((A53, 54). A small pilot plant embodying the invention was made to determine its commercial possibilities and was installed on a grinding machine at Norma-Hoffman. It operated successfully (A54). As a result, Norma-Hoffman bought a full scale froth flotation central system from appellant and it successfully clarified their entire coolant volume (A54, 55).

The small pilot plant was also tried out at Yale & Towne. Employees there tried to overload it by throwing 8000 grams (about 17 lbs.) of excess sludge into the coolant but it successfully clarified the coolant and showed its tremendous capacity (A52).

Dr. Booth made a laboratory demonstration of the invention to Bullard, whose company had rejected all prior emulsion coolant clarifying systems as impractical (A32). A small test unit was installed on one of the grinding machines in the Bullard plant. It operated so well that it amazed the entire working personnel of the plant (A33). This was later replaced by a large commercial central flotation clarifying system embodying the invention for handling the contaminated coolant from all their grinding machines working on numerous different types of material. It was a complete success (A30, 31).

Bennett went to sell Norma-Hoffman a U. S. Hoffman filter clarifier. He saw the commercial central froth flotation clarifier system obtained from appellant in operation (A66, 67). The following testimony as to his impression is significant (A67):

> "Q. What was your impression based on your observation as of that time? A. *Frankly I was very excited.*
>
> Q. Why? A. Because it was perfectly obvious to me that if we didn't get hold of it it would put us out of business as far as water-soluble emulsions were concerned.
>
> Q. You mean in the sale of filters? A. Yes. *I felt it would supersede the filter as a water-soluble emulsion clarifier."*

Bennett immediately visited Dr. Booth and asked whether U. S. Hoffman Machinery Co. might secure a license under the froth flotation clarifying process (A67).

After field tests of its own with a test froth flotation unit loaned by appellant, U. S. Hoffman became the exclusive licensee under the present application (A68, 107).

When news of the invention spread, other companies also sought rights thereunder. Turbo Equipment Company, disrtibutor of the DeLaval centrifuges for coolant clarification, sought to secure rights to market the invention. Such interest from this particular concern is obvious recognition of the superiority of the invention over centrifugal treatment (A107).

Another concern, makers of milling and grinding machines, also repeatedly sought rights to market the invention. This was Cincinnati Milling and Grinding Machine Company (A107).

When U. S. Hoffman began commercial production of units embodying the invention in 1945, at the end of World War II, Bennett found the machine tool concerns interested but skeptical because, as he stated (A68):

> "It seemed a little difficult for them to believe that *the problem of constant cleaning of clarifying equipment was at an end.*"

But U. S. Hoffman was extremely successful in selling the invention. Bennett sold many units (A68) and to the concerns to whom he had sold filter units (A70). The list of its customers (A110) covers many industries and includes many of the largest concerns in the country using machine tools requiring emulsion coolants—General Motors, Ford, Chrysler, General Electric and many others. The list shows also the great operating capacity of the invention—units capable of clarifying up to 700 gallons of contaminated coolant per minute, ranging in price from $300 up to $80,000 or $90,000 (A69). The list also shows many repeat customers. Ford, for example, bought 18 units. Bennett stated that the customers were completely satisfied. (A68, 69). He sold the units continuously for U. S. Hoffman until he retired from the company in 1949 (A68).

Uninterrupted clarification of emulsion coolants with continuous removal of solid contaminants as fast as recovered was what had been needed for years. When the invention finally provided it, those selling competitive units lacking such advantages and the field of users accepted the invention as a revolutionary success. No clearer case of commercial success of an invention could be imagined.

The Main References

Two prior defense patents are principally relied upon by appellee against claims 33 to 43.

Brown Patent 1,455,187 (Ex. Bk. 1-D): This involves clarification of emulsion coolants for grinding machines by centrifugal action in a fluid circulating system. A centrifugal bowl centrifuge 1 separates and deposits the finer solid particles in chambers 25 and 27. Periodic shutdown is required for removing the deposited solids (A96-97.) A settling tank 2 is usually employed to remove coarser particles preliminary to flow of coolant into the centrifuge.

This type system has herein previously been shown by the evidence not to be self-cleaning and not continuous, capable of clarifying only a part of the coolant volume and requiring shutdown for cleaning at too frequent intervals, to be impractical and to have failed to satisfy the need of machine tool users (Supra, pp. 23, 24)

This patent failed in the very respect in which the inventive process succeeded—the continuous elimination of the solid contaminants as fast as removed from the coolant so that continuous operation without shutdown and on full coolant volume is obtained.

Appellee does not apparently contend that this patent shows a process equivalent to the inventive process in issue. Thus the patent has only the non-anticipatory value of showing that another had heretofore proposed an inferior method, which failed of a general acceptance by industry because of inherent faults.

Findings 4, 9, 16, 18 and 20 (A. 14, 15, 16 & 18) fail to reflect the inherent objections to the use of a centrifuge and all other prior devices for coolant clarification. This is particularly true of Finding 19 (A. 18) and the evidence is against it.

Booth Patent 2,153,449 (Ex. Bk. 1-A): This patent is in the field of rayon manufacture, which is obviously quite non-analogous to the various fields employing machine tools and employing emulsion coolants. The patent is directed to a process for clarifying fouled spin baths used in the viscose rayon manufacture. Chemically active, strong (8-10%) sulphuric acid baths are employed to react with cellulose xanthate viscose to produce rayon filaments.

In the course of the reaction decomposition products are formed, including finely divided colloidal sulphur, which foul the bath. Clarification of the acid bath is accomplished by froth flotation. (Ibid, page 1, col. 1, para. 2) with or without added reagents (Ibid, page 1, col. 2, lines 3-10). The only solid decomposition product identified as being in the bath is the sulphur. It is stated that other unidentified impurities are floated (Ibid. page 1, col. 1, lines 51-55). It is also stated that in the froth concentrate, after flotation there is about 80% sulphur and a small balance of unrelated impurities (Ibid. page 1, col. 2, lines 32-35). Claim 1 of the patent refers to the impurities as "turbid".

There is no clear indication in the patent that in the chemically active fouled spin bath prior to the agitating and aerating action of flotation there is any solid impurity other than sulphur. In his testimony Booth indicated that the only solid and the turbid impurity to be removed from the bath is the sulphur, which he pointed out is in elemental state (A82, 83, 102). Falconer also indicated that the essential problem is to remove the sulphur (A106). Booth stated that if solids such as sand were present in the spin bath they would settle (A85).

It is unimportant whether or not there is any implied teaching in the patent of removing mixed solids from a liquid by flotation. There is clearly no disclosure of removing mixed solids of the nature of metal, grit and dirt, the contaminants found in emulsion coolants. As experts in froth flotation both Booth (A87, 88) and Falconer (A106) testified that the spin bath patent would not suggest the use of froth flotation for clarifying emulsion coolants. Booth explained that this was because there was no parallel in the two situations since entirely different materials were involved (A83).

Both witnesses pointed out that sulphur is very easy to float (A84, 106). But if mixed solids, of the nature of those which contaminate emulsion coolants, were put in the strong acid chemically active sulphuric acid spin bath, Booth points out (A84) that they would not float. Falconer points out, more specifically, that the metal contaminants would dissolve and that other non-metal solids of the mixture would settle (A106). This finds confirmation in the statement in the Sulman patent (Supra, page 1, lines 36-51) that strong acids react with metals. Further, the coolant emulsion itself is unrelated to the acid spin bath. Booth points out that if an acid is added to an emulsion coolant it would be wrecked (A101). It is thus apparent that both the liquid vehicles and the solid contaminants to be removed therefrom, in the case of emulsion coolants and in the case of chemically active sulphuric acid rayon spin baths, are entirely non-analogous.

As before pointed out (post. p. 14) there is a direct analogy as to their nature between the oily emulsion coolant, and the mixed solids, of the froth flotation process in the mineral dressing field. This relationship would be evident to any one versed in froth flotation practice.

And, we point again, also, to the fact that emulsion coolants not only are oily compositions, which uniquely provide the environment for selective separation as a mass of mixed solids of the nature of those which commonly contaminate the coolants; the coolants are complex liquid mixtures of emulsion nature, and the prior knowledge is that emulsions, even obstinate emulsions, are subject to breakdown and separation by froth flotation (A76).

Thus the rayon spin bath patent not only fails, because of its entirely different materials, of any relevant teaching, or suggestion, of emulsion coolant clarification, it is submerged by other directly pertinent knowledge of the selective behaviour of froth flotation towards solid materials of similar nature, and that used emulsion coolants should neither remain stable nor be completely clarified of all their mixed contaminating solids.

Finally, we pointed out that the spin bath patent, though made of record, was not used by the Examiner in the Patent Office as a ground of rejection for any of the claims (A140). This is significant, because the Examiner is the Patent Office expert. As such, he had the knowledge to appreciate the non-analogy of the materials involved in rayon spin bath clarification to the complexity of entirely different liquid and solid materials of contaminated emulsion coolants. The Board of Appeals in the Patent Office did use the patent as a ground of rejection (A152, 159) but under circumstances implying their failure to appreciate the very vital significance of the nature of materials with respect to what happens to them under froth flotation.

Findings 10 and 21 (A16, 19) also Findings 16 and 20 (A18, 19) fail to reflect the limited disclosure of the Booth patent or the totally different nature of the materials processed from contaminated emulsion coolant.

Six further defense patents against claims 33 to 43 can be briefly disposed of. They are only collaterally relied upon by appellee and the pertinent Findings of the trial court reflect their fundamental differences from the claimed process.

Karlstrom Patents 1,717,223 & 2,248,177 (Ex. Bk. 1-F & 1-G): Finding 11 (A16) clearly points out that these patents do not show a froth flotation process or the flotation of mixed solids. An essentially different type of process, floc flotation, is employed for the clarification of "white" washwater in the paper and pulp industry of fibers, which is of no relevancy whatever to the claimed emulsion coolant clarification process requiring froth removal of contaminants, a process different in kind.

As pointed out in the testimony of Booth, paper and like organic fibers are flocculated by chemical agents. The resulting dense fiber mass is introduced into a quiescent zone wherein it is slowly levitated by air bubbles without a froth. Instead of providing a foam-producing type agitation, slowly rotating stirrers (1 or 2 r.p.m.) control the gradual rise of the flocced fibers. (A88, 94- 96). Illustrating the difference in the nature of the action between the two types of processes, Booth pointed out that fibrous materials of this nature cannot be successfully floated by froth flotation because high speed rotary agitation used (A96) would prevent the fibers from rising (A95).

Sulman et al Patent 835,120, Callow Patent 1,366,767 and Munro Patent 1,937,837 (Ex. Bk. 1-I, 1-E, & 1-H): These patents are all concerned with the concentration by froth flotation of minerals in the mineral dressing field.

As already pointed out (supra p. 13) a selective separation is effective between mixed solids in a liquid with flotation of a single solid, instead of a non-selective flotation of mixed solids.

Findings 13, 14 & 15 (A17) correctly reflect the fundamental differences in kind between the process of these patents and the emulsion coolant clarification process. However, none of these or the other Findings reflect the general similarity in nature of the mixed solid particles in the two situations.

The patents are significant as emphasizing the uniqueness of the inventive process of coolant clarification and as pointing away from the feasibility of such process, not as having any anticipatory value.

Breerwood Patent 2,214,717 (Ex. Bk. 1-C): This patent is directed to the concentration or benefication of cement materials. As pointed out in the patent (p. 1) froth flotation effects mineral separation. The process is the same as in the mineral dressing patents just discussed in the mineral dressing field (A82). They are entirely parallel.

Finding 12 (A16) correctly reflects the essential differences in operation from the present inventive process which show the irrelevancy of the patent as a reference.

The Double Patenting Issue Raised on Appellant's Improvement Patent

Double patenting is asserted as an additional defense against claims 39 and 40 because they allegedly, "define the same substantial subject matter" (Finding 22 (A19)) as one claim of a patent granted on an application filed later than, and co-pending with, the application in suit by the same inventors for an improvement invention. This issue was raised for the first time in the trial court and had not been raised in the Patent Office.

The issue turns on preliminarily subjecting the contaminating emulsion coolant to a settling step for settling out coarser contaminating solids before agitation and aeration for the removal of the balance of the contaminating solids by froth flotation. A conventional type settling tank for such purpose is illustrated at the upper right of Fig. 3 (A137A), and example 3 of the specification (A127) describes a settling step for a portion of contaminants "which tended to settle" and comprising "coarser particles of metal".

The material portion of claim 39 (A135) is:

> "subjecting the contaminated coolant to settling for only a sufficient time to remove *those larger and agglomerated contaminants of sufficient mass to be unamenable to froth flotation;*

collecting the settled solids,"

and that of claim 40 (A135) is:

> "continuously passing the contaminated coolant through a relatively quiescent zone in which the period of dwell is only sufficient to permit *those larger and agglomerated particles of sufficient mass to be unamenable to froth flotation* to settle;

collecting the settled contaminants;"

A significant feature of both claims is that the contaminants settled are only those which are "unamenable to froth flotation". It is contemplated that full advantage be taken of the capacity of froth flotation to remove all portions of the contaminants which are amenable to froth flotation.

Booth and Morash Patent 2,436,375 (Ex. Bk. 1-B): Claim 7 of this patent (Ibid. col. 13) is alleged to claim the same substantial invention as aforesaid claims 39 and 40 here involved. Such claim is as follows, except for the omission of portions not pertinent to the double patenting issue:

> "7. A process adapted to the continuous removal of substantially all the solid contaminants from lubricated coolants contaminated therewith,
>
> at least a portion of which are incapable of removal by settling, * * *, which comprises the steps of
>
> passing contaminated coolant through a *non-turbid zone* and into a turbid zone,
>
> *the upward component of the fluid velocity in said non-turbulent zone being less than the falling rate of contaminants too large for practical concentration by froth flotation,*
>
> whereby said oversize contaminants are dropped from suspension before entering the turbulent zone,
>
> * * * and removing settled particles from said first zone *without substantially altering the fluid flow conditions therein.*"

This claim requires a special type of settling step wherein controlled sufficiently slow flow is maintained in the non-turbid (settling) zone such that the contaminants which will have sufficient time to settle will include those too large "for practical concentration by froth flotation." This would include, in addition to the coarse solids settled under claims 39 and 40, a portion of the solids which are floated under the latter claims as amenable to froth flotation, but which cannot be froth floated so easily so that they are "too large for practical concentration by froth flotation."

Thus claim 7 provides for the settling of more contaminants and the froth flotation of less contaminants that claims 39 and 40 in clarifying the coolant. This permits the use of a smaller flotation unit which will clarify a lesser load. The use of a settling tank of special cross-sectional area is required as explained in the patent specification (Col. 5, line 72 to col. 6, line 21; col. 7, lines 20-26). An improved, more efficient, coolant clarifying process is provided, as further explained in the patent specification (Ibid. col. 5, lines 10-14; col. 5, paras. 2 and 3). The improved process of claim 7 of the patent is not disclosed in the application in suit and such claim is directed to subject matter substantially differing with respect to the settling and flotation steps in substance from claims 39 and 40.

The last section of claim 7 further calls for removal of the settled solids "without substantially altering the fluid flow conditions" in the non-turbulent settling zone. Should such disturbance occur some of the solids amenable to flotation but intended to be settled would be carried by the coolant into the turbulent froth flotation zone. This is contrary to the intent of the earlier portion of the claim. Removal without disturbance of settling may be accomplished by careful hand removal or by automatic rakes which avoid disturbance. (Ibid. Figs. 2 and 3, col. 9, lines 5-8; col. 7, lines 27-50, also A78-81).

Claims 39 and 40 do not require the special manner of removing settled solids required by the limitations of the section of claim 7 just referred to. Some disturbance in the settling zone would not necessarily prevent the settling of only those coarser solids which are "unamenable to froth flotation", which are the only solids settled according to claims 39 and 40.

Claims 39 and 40 of the application in suit and claim 7 of the improvement patent are materially different in substantial subject matter and scope. No basis in fact is found for raising the issue of double patenting against claims 39 and 40, or in support of Finding 22 (A19).

The Errors of the Patent Office

The Examiners found patentability in the inventive process as limited to a particular type of agitation ("intense mechanical agitation") and allowed claims 34, 37 and 38 (A133, 134). He disallowed claim 35 (A133) as drawn to a non-elected species.* The Examiners held the balance of the claims in suit to be unpatenable over miscellaneous combinations of certain of the present defense patents (A137, 142). One of the Examiners cited the Booth rayon spin bath patent (A140) but did not employ it in his rejection.

The Board of Appeals did not agree with the Examiners grounds of rejection, except as to claim 35, and held all of the claims in suit, including the claims previously allowed unpatentable over different combinations of certain of the defense patents (A148), and for new reasons (A153). Among the references relied upon with other patents was the Booth rayon spin bath patent, but only for the limited purpose of showing that the omission or addition of flotation reagents was old (A151). In its first decision the Board of Appeals held that the issue on patentability over the prior patents was (A151):

> "In view of the selection of a known flotation cell to carry out the process, we consider that the *real issue presented is the question of invention involved in broad use of flotation without the use of flotation agents* in separating the contaminating solids from the particular liquid here clarified and that allowance of any claims in the application depends upon finding invention involved in such proposition."

In its last decision on reconsideration the Board of Appeals had the following to say in adhering to its previous rejection (A157, 158):

> "In the development of the art as represented by the cited patents, we can only conclude, in *the absence of contrary showing in a specific instance, that it would be more logical to expect a flotation agent that had not been specifically developed for selective action to have a general flotation effect, rather than a selec-*

*** If the Court finds broader claim 42 to be patentable, claim 35 should be held to be patentable therewith.**

> *tive effect.* The selective action would appear to depend upon a number of factors which would have to be investigated. It *would therefore appear to us to present more likelihood of invention to discover a selective flotation* separation previously unknown, than *to find the general susceptibility to* froth flotation *of all solids in a mixture,* or to find that a flotation agent selective as to certain solids was not selective in general as to other solids."

The following errors are found in the decision of the Patent Office tribunals:

1. The failure to appreciate and give regard to the different working of froth flotation with respect to the result secured.

For example, the Board failed to find any significant difference between selective separation of mixed solids by froth flotation and the mixed recovery of solids without separation by froth flotation, an essential difference in kind.

2. The Board further erred in failing to consider and to give effect to the differences in the nature of materials processed by froth flotation in their determining effect upon the results of froth flotation.

We have shown previously (supra pp. 10-16) that the nature of the materials processed by froth flotation is a vital factor.

3. The Board erred in failing to recognize and give effect to the essential differences in type between froth flotation process and a floc flotation process (the Karlstrom patents).

This error was glaring and, with errors 1 and 2, manifests fundamental lack of knowledge of froth flotation.

4. The Board erred in misconceiving that a mass flotation of mixed solids presented no unusual phenomena and

in failing to appreciate that it presented an entirely different problem from the selective separation of solids.

5. The Board did not realize that all flotation reagents are selective in action towards only particular solids for floating and mistakenly assumed the availability of non-existent reagents having non-selective action towards solids and which could be added to effect mass flotation of all mixed solids desired to be removed by flotation.

The Examiners were largely guilty of the same errors as the Board of Appeals, and probably misled the Board in failing to inform it fully about froth flotation in its different workings and in the effect of the materials processed upon the results.

The Trial

At the trial in the court below, six witnesses were called for the appellant. They included the inventors, Dr. Robert Ben Booth and Norman Morash and Stuart A. Falconer, all experts in the art of froth flotation. Robinson Bullard was called as a man of experience in the machine tool industry familiar with emulsion coolants and the problem of clarifying them. Gordon C. Bennett was called because of his familiarity with the problem of coolant clarification. Both Bullard and Bennett were familiar with the inventive process in issue and its differences from prior efforts at coolant clarification. Bennett and Frank A. Griffin were familiar with the licensing of the inventive process to U. S. Hoffman Machinery Corporation.

The most pertinent portions of the testimony of the various witnesses has been cited or quoted before. The mass effect of the testimony, including Booth's explanation of the defense patents, is overwhelmingly against the decisions in the Patent Office.

The Decision Below

The District Court rendered its opinion (A13) many months after the trial, finding no invention and relying on the Supreme Court decision, rendered ten days previous, in the *Great Atlantic & Pacific Tea Company* v. *Super Market Equipment Corporation,* 340 U.S. 147. Findings of Fact 17, 18, 20 and 21 in part adopt the position of the Board of Appeals, but such findings and further Finding 16 (A 18, 19) differ from all of the decisions in the Patent Office in stressing the Booth rayon spin bath patent as a major reference against the claims in suit.

Conclusions 2 and 3 (A19, 20) fail to reflect any consideration of the different workings of froth flotation in different and non-analogous fields, nor the effect of the nature of the materials processed as to the results of froth flotation.

Finding 22 (A19) on the double patenting issue as to claims 39 and 40 appears to be beyond the scope of the Court's opinion.

STATUTE INVOLVED

The only statute involved is that giving jurisdiction to the District Court to entertain an action to secure a patent, R.S. sec 4915, 35 U.S.C. sec 63.

STATEMENT OF POINTS

The District Court erred essentially in the following particulars:

> A. In failing to find that combination of process steps for emulsion coolant clarification defined by claims 33 to 43 involves unique phenomena and produces new and surprising results which are unforeseeable from the references, much less disclosed thereby.

B. In failing to find a difference in kind between the claimed process in suit and the processes of the references, for the reason that froth flotation is not a process but a manipulative technique which is a slave to its environment and yields results which are dependent upon and differ in kind with, the nature of the materials processed, and because contaminated emulsion coolants are non-analogous materials in a new and non-analogous field which froth flotation, in clarifying, produced results which were beyond any the prior art has realized or contemplated.

C. In failing to reverse the errors as to facts of the Patent Office on the basis of the undisputed evidence presented at the trial.

D. In failing to reject, as groundless, appellee's contention that claims 39 and 40 should be refused under the rule against double patenting.

SUMMARY OF ARGUMENT

1. Where this Court on review of all pertinent facts and uncontroverted evidence regarding a claimed invention concludes that trial court's decision was clearly erroneous, this Court reverses.

2. This Court should reverse and hold that upon the evidence, under the law applicable, the claimed process in suit is a new and patentable process, for a new use of the old manipulative steps of froth flotation in a new and non-analogous field, producing phenomenal new results which were entirely unforeseeable from prior knowledge, and satisfying a new and recognized want.

3. The A. and P. case has no application.

4. This Court should reverse on the double patenting issue because the claims referred to are materially different in substance.

ARGUMENT

1. Where This Court on Review of All Pertinent Facts and Uncontroverted Evidence Regarding a Claimed Invention Concludes That Trial Court's Decision Was Clearly Erroneous, This Court Reverses.

Under the "clearly erroneous" rule this Court has repeatedly reversed the judgment of the trial court on a suit to obtain a patent when the judgment is based upon findings of fact shown by the evidence to involve clear error. *Standard Oil Development Co.* v. *Marzall,* 86 App. D. C. 210, 181 F. 2d 280; *Levin* v. *Coe,* 76 App. D. C. 347, 132 F. 2d 589; *Poulsen* v. *Coe,* 73 App. D. C. 324, 119 F 2d 188; *Carbide & Carbon Corp.* v. *Coe,* 69 App. D. C. 372, 102 F. 2d 236.

The trial court failed to make any findings of fact reflecting the true facts shown by the evidence regarding appellant's process and the references, as it should have. *Levin* v. *Coe,* supra. Had the court made proper findings as to the facts they would have been irreconcilable with the court's opinion herein and shown clearly that such opinion and its supporting main Findings 16, 17, 18, 19, 20 and 21 (A18, 19) were without foundation.

Where, as here, substantial additional evidence not before the Patent Office was before the District Court, the decisions of the Patent Office are not to be given the same presumptive weight as they would have been entitled to if based upon the same facts as before the Court. *Standard Oil Development Co.* v. *Marzall,* supra. This rule is particularly applicable in the present case since, as we have shown (supra pp. 35, 36) the Examiner and the Board of Appeals were not in agreement and found different reasons for rejection and their decisions show clearly that they misunderstood the references. Even less presumptive weight is to be attached to the decision of the District Court since it based its holding of unpatentability primarily upon the Booth sulphuric acid rayon spin bath patent, to which the tribunals of the Patent Office had given only casual weight.

2. This Court Should Reverse and Hold That Upon the Evidence, Under the Law Applicable, the Claimed Process in Suit Is a New and Patentable Process, for a New Use of the Old Manipulative Steps of Froth Flotation in a New and Non-Analogous Field, Producing Phenomenal New Results Which Were Entirely Unforeseeable From Prior Knowledge, and Satisfying a New and Recognized Want.

The capability of froth flotation to clarify used emulsion coolants indiscriminately of their miscellaneous contaminating solids was an amazing accidental discovery and extended the use of froth flotation into an entirely new field where it satisfied the long existing need which others had tried unsuccessfully to fulfill (supra pp. 24-27). These circumstances point strongly to the patentability of the inventive process.

Where a process satisfies an old and recognized want in a field patentable invention may be inferred rather than the mere exercise of mechanical skill. *Paramount Publix Corp.* v. *American Tri-Ergon Corp.,* 294 U. S. 464; *Levin* v. *Coe,* supra. Otherwise the mere skill of the art would have been called into action by the known want. *Loom Co.* v. *Higgins,* 105 U. S. 580; *Carbide & Carbon Corp.* v. *Coe,* supra; *Thornton* v. *Coe,* 69 App. D. C. 383, 102 F. 2d 247.

A particular strong case is made out where others have endeavored to solve the want in numerous other ways which have been subject to serious objection and failed of general acceptance. *Wachs* v. *Coe,* 64 App. D. C. 235, 77 Fed. 2d 113. And the fact that a process was immediately accepted as so great an advance over anything known before it that it came into extensive use and largely replaced all earlier processes gives added reason to find patentable invention. *Mineral Separations Ltd.* v. *Hyde,* supra; *Kelley* v. *Coe,* 69 App. D. C. 202, 99 F. 2d 435.

Circumstances such as the foregoing must be measured with other factors, as the unobviousness or obviousness of using an old process in a new use depends upon the facts of each case. *Levin* v. *Coe,* supra; *Reed* v. *Coe,* 76 App. D. C. 369, 132 F. 2d 599. And where an old process is merely applied to a new and closely analogous subject matter, plainly indicated by the prior art, and accomplished only an old result, patentable invention cannot be found, *Paramount Publix Corp.* v. *American Tri-Ergon Corp.,* supra. And this be true under such circumstances where the further use for a similar result provided additional benefits beyond its old working than might have been foreseen. *Lovell Mfg. Co.* v. *Cary,* 147 U. S. 623.

Where, as here, the old process has been carried into a new field, the clarification of emulsion coolants for machine tools, we have an entirely new and non-analogous use to the working of froth flotation in the mineral dressing field and in connection with spin baths in the rayon manufacturing field. Clearly such a non-analogous and new use is persuasive of invention, *Potts* v. *Creager,* 155 U. S. 597; *Cochrane* v. *Diener,* 780, 788; Walker on Patents (Deller ed. 1937) 232-234.

We have an important further circumstance here in that froth flotation is not, strictly, a process. It is a technique of manipulative steps (agitation, aeration, solid flotation and removal in froth), which is unpredictable in its working. It is a slave to its environment and the results obtained are dependent upon and vary widely with the nature of the liquid and solid materials to be processed. It may be used to treat mixed liquids alone with one result and, in its greatest field of utility, in the selective separation of mixed solids in liquid with flotation of one solid. Thus froth flotation is not the usual type of process which produces essentially the same result in its use with different materials. It does not respond to the definition of *Cochrane* v. *Diener*, supra, that a process is mode of treatment of *certain materials* to produce a given result. See *Kelley* v. *Coe*, supra.

Because of its unpredictability and varied working of froth flotation, the prior art relied upon by appellee must be strictly tested as to its disclosure. To anticipate it must do more than show that froth flotation units of various types are known and for different uses. To anticipate the process herein claimed, it is necessary to show not only that the prior art might have been used to carry out the process but that such use was contemplated or would have been obvious to an ordinary mechanic having knowledge thereof. *Carnegie Steel Co.* v. *Cambria Iron Co.*, 185 U. S. 403; *Kelley* v. *Coe*, supra.

The prior art fails to meet this test. The narrow teaching of the rayon spin bath patent that such a bath can be clarified of its turbid decomposition products and plainly limited in its disclosure to such use is obviously inadequate to suggest the adaptability of froth flotation in an entirely new field for clarification of emulsion coolants of their contaminating solids, which liquids and solids are of entirely different nature than those of contaminated rayon spin baths. The teaching of the further art, moreover, more relevant to the materials with which the present invention is concerned not only failed to show the adaptability of froth flotation to emulsion coolant clarification but, for reasons we have pointed out (supra, pp. 14, 15) strongly point to the unsuitability of froth flotation for this special new purpose.

We have, also, the strong added factor that three experts in froth flotation (supra pp. 10, 11, 19, 20) gave undisputed testimony that the prior art did not make foreseeable emulsion coolant clarification and that in such use froth flotation provided an amazing phenomena in its working which was entirely beyond their experience.

The law and the evidence, collectively, lend full support to the patentability of the claimed process.

3. The A. & P. Case Has No Application.

The trial court indicated in its opinion (A13) that no invention in the claims in suit was strongly influenced by the recent decision of the Supreme Court in *The Great Atlantic and Pacific Tea Co.* v. *Supermarket Equipment Corp.,* 340 U. S. 147.

Yet the Supreme Court in such A. and P. case laid down no new standard on invention or made any declaration which should have caused the trial court to have disregarded the preponderant showing of the evidence of invention in this case and the applicable law well settled by established prior legal decisions. Nor is there any ruling in the A. & P. case which should cause this Court to change its rule on review, or to evaluate the evidence here on any different basis than that which has caused this Court to reverse in many of its decisions, of which those we cite above are typical.

The first principle quoted from the Supreme Court in the opinion below, that patents cannot be granted which tend to subtract from former resources fully available to skilled artisans, clearly has no application to the present case. The invention here extended froth flotation into an entirely new field of emulsion coolant clarification, where it was sorely needed and thereby extended the knowledge of the art. And skilled artisans had failed to appreciate that froth flotation was available for such purpose, although the technique of froth flotation had been known since at least 1906 when the Sulman et al patent 835,120 was granted and thirty-five years elapsed before Booth and Morash in 1941 accidentally discovered what skilled artisans had overlooked.

The second principle quoted from the Supreme Court in the opinion below, to the effect that invention is not the usual result of uniting elements old in mechanics, is likewise inapplicable here in the light of the showing (supra pp. 10-16) that froth flotation operates differently in dependency upon the nature of the materials processed and in its application to emulsion coolant clarification produced results which were not only not usual but amazing.

4. This Court Should Reverse on the Double Patenting Issue Because the Claims Involved Are Materially Different in Substance.

Appellant abandoned nothing it has the right to claim in the 1942 original application in suit by taking out its patent 2,436,375 on its copending later filed 1943 application claiming a distinct improvement upon its earlier claimed process. *The Barbed Wire Patent,* 143 U. S. 275, 280. Claim 7 of the patent claims a specific and clearly defined improvement in the preliminary settling stage and could not have been made in the 1942 application for lack of supporting disclosure.

The grant of a specific patent does not bar the later grant of a generic patent where the applications for the patents were copending in the Patent Office. *Kaplan* v. *Robertson,* 50 F. 2d 617, 621; *Gear Grinding Machine Co.* v. *Reo Motor Car Co.,* 50 F. 2d 617. The Patent Office continued to reject claims 39 and 40 of the original application in suit after the improvement patent was granted, and Appellee alone is responsible that a patent was not granted on these claims first.

The rule against double patenting applies only where an attempt is made to secure claims which are in substance the same as and not separable from the claim of an issued patent of the same party. *Miller* v. *Eagle Manufacturing Co.*, 151 U. S. 186, 198; *In re Peiler,* 20 CCPA 718, 62 F. 2d 98. We have shown beyond a doubt (supra pp. 32-35) that claims 39 and 40 in suit and claim 7 of the improvement patent are distinctly different in their subject matter, so the rule does not apply.

There had been no rejection of the claims in the Patent Office. Whether the trial court mistook the law does not appear from its opinion (A13). In any event, its Finding 22 (A19) that claims 39 and 40 are unpatentable for double patenting is contrary to the actual facts and without support under the law and should be upset.

CONCLUSION

For all the reasons stated it is submitted that the judgment should be reversed with instructions to grant the prayer of the complaint.

Respecftully,

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Dated September 27, 1951

BRIEF FOR APPELLEE

United States Court of Appeals for the District of Columbia Circuit

Appeal No. 11,096

American Cyanamid Company, *Appellant*

v.

John A. Marzall, Commissioner of Patents, *Appellee*

United States Court of Appe
For the
District of Columbia Circu
FILED OCT 18 1951
Joseph W. Stewar
CLERK

Appeal From the Judgment of the United States District Court for the District of Columbia

E. L. Reynolds,
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Clarence W. Moore,
Of Counsel.

STATEMENT OF QUESTIONS PRESENTED

In the opinion of appellee, the two questions presented for determination on this appeal are:

1. In view of the teachings of the prior patents cited by appellee, and particularly of the joint teachings of the respective patents to Brown and applicant Booth, Nos. 1,455,187 and 2,153,449, did it require invention to devise the process defined by the claims in controversy?

2. Do claims 39 and 40 of the application of Booth and Morash on appeal define the same substantial subject matter as claim 7 of the Booth and Morash patent, No. 2,436,375, which was granted on a later-filed copending application, and are claims 39 and 40 unpatentable for double-patenting?

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United States Court of Appeals for the District of Columbia Circuit

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Appeal No. 11,096

AMERICAN CYANAMID COMPANY, *Appellant*

v.

JOHN A. MARZALL, Commissioner of Patents, *Appellee*

Appeal From the Judgment of the United States District Court for the District of Columbia

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BRIEF FOR THE COMMISSIONER OF PATENTS

INTRODUCTION

This is an appeal from the judgment (A 20) of the United States District Court for the District of Columbia dismissing the complaint in Civil Action No. 1887-48, entitled *American Cyanamid Company* v. *Marzall.* The same court concurrently dismissed the complaint in companion Civil Action (A 13 and 14) No. 96-49, likewise entitled *American Cyanamid Company* v. *Marzall,* but no appeal was taken from that dismissal.

Both civil actions were brought under the provisions of Section 4915 R. S. (35 U. S. C. 63), and sought authorization for the issuance of patents to the American Cyanamid Company, as assignee of the two applications involved.

The application, Serial No. 443,816, involved in the appeal is entitled "Method for Clarifying Lubricating and Cooling Emulsions," and was filed in the Patent Office by Robert Ben Booth and Norman Morash on May 20, 1942 (A 14 and 118). Claims 33 to 43, inclusive, remain in that application, and they alone are the subject of appellant's complaint (A 2) and of its appeal.

The Patent Office Board of Appeals (A 148 and 156) and the District Court (A 18, Finding of Fact No. 20; A 19, Finding of Fact No. 23) concurred in holding that claims 33, 34, 36, 37, 38, 39, 40, 41, 42, and 43 are unpatentable in view of the prior art cited, and in refusing to allow claim 35, because drawn to a non-elected species. The District Court (A 19, Finding of Fact No. 22) additionally ruled that claims 39 and 40 are further unpatentable on the ground of double patenting.

THE APPLICATION ON APPEAL

The clarification of lubricating coolants, to which, as indicated, the application on appeal is directed, has been the subject of prior investigations by others, as the application (A 118 to 132) points out (See also Brief for Appellant, pages 21 to 24). Applicants and those others have been concerned with the light oil solutions of soaps, which, as cut with water to form emulsions, have been used to abstract heat and to lubricate tools employed in metal working operations, including grinding. In such operations, these oil-in-water emulsion-type lubricating coolants pick up, as contaminants, metal particles and cuttings, abrasive grit and dirt.

To remove such contaminants from the lubricating coolants, applicants' predecessors have resorted to such separating procedures as:

(1) Settling (A 119, first sentence).

(2) Filtration (A 119, second sentence).

Also available to the workers in the art have been such other known separation processes as:

(3) Tabling (Cf. A 128, final paragraph).

(4) Centrifuging (Cf. A 128, final paragraph).

(5) Magnetic separation (Cf. A 131, final paragraph; A 132, first paragraph).

To remove the described contaminants, applicants resort to froth flotation. They assertedly have used (A 123, second paragraph) a "Fagergren" flotation machine with satisfactory results, but they expressly state that "other known types of flotation cells, whether of a mechanical type, a pneumatic type or an apparatus employing a combination of both may be used effectively" (A 124, first paragraph). The contaminated lubricating and cooling emulsions can be subjected to froth flotation with or without the use of additional flotation reagents (Brief for Appellant, page 6, fourth paragraph). Additional reagents may, in some instances, be dispensed with, because, as already indicated, the emulsions "are made from oil containing various soap," and hence the "used emulsion when subjected to the action of a flotation machine froths readily" (A 121, second paragraph; Cf. A 157). When the addition of a frothing agent is necessary, applicants add such common frothers as pine oil and the like (A 122, first paragraph).

Applicants specify that the flotation process may be used in combination with the "other known separation processes" of settling, filtering, tabling, centrifuging, and magnetic separation (A 127, final paragraph through A 129, third paragraph; A 131, first paragraph through A 132, first paragraph).

THE CLAIMS ON APPEAL

Applicants' froth flotation procedure or technique for the clarification of lubricating coolants is expressed in its broadest aspect in claims 33 and 41 (A 3, 6, 132, 136, 142, and 143), which read as follows:

> 33. The process of clarifying a used, oil-in-water, emulsion-type, lubricating coolant contaminated by solid particles, without appreciably altering the physical properties of the original coolant, which comprises the steps of simultaneously subjecting a volume of said used coolant to aeration and intense agitation in the absence of added reagents, whereby a froth layer is formed at the surface of said coolant volume and substantially all said contaminants are concentrated in said froth layer as it forms; removing the contaminant-bearing froth from said froth layer and recovering the so clarified coolant.
>
> 41. The process of clarifying used, oil-in-water, emulsion-type, lubricating coolants contaminated

> by metallic and other solid particles, without appreciably altering the physical characteristics of the original coolant, which comprises the steps of establishing a volume of used coolant having a free surface; simultaneously subjecting said volume of used coolant to aeration and agitation sufficient to form at said free surface a froth layer containing substantially all of said contaminants concentrated in said froth layer, collecting the contaminant-bearing froth from the so-treated coolant and recovering the so-clarified coolant.

Patterned on claim 33, claim 34 additionally recites that the agitation is "mechanical," as does claim 38, while claim 37, which is dependent on claim 34, calls for recycling of the clarified coolant, which is to say, retreatment of it in the flotation cell. Patterned on claim 41, claim 42 additionally requires that the agitation be "intense" and "physical." Claims 36, 38, and 43 define the process as continuous, as do claims 39 and 40. Claims 35, 39, and 40 bring in the feature of employment of the flotation process with specified other known separation processes. In claim 35, the other process is magnetic separation, in claims 39 and 40, it is settling.

Claims 33 and 41 are nearly identical. Claims 34, 36, 37, 38, 39, 40, 42 and 43, differ in detail from each. From the standpoint of patentability over the prior art, the latter group of claims would seem necessarily to stand or fall with claim 33, or what is the same thing, with claim 41 (Cf. *In re Ripper, deceased, etc.,* 36 C. C. P. A. 743, 171 F. 2d 297). At the hearing in the District

Court, appellant selected (A 15, Finding of the Fact No. 8) claims 33 and 40 as typical, and determination of the question of patentability of all the claims accordingly can, in any case, be predicated upon a consideration of these two claims.

Claim 35 is drawn, as just indicated, to the species of applicants' general process in which clarification of the coolant is accomplished, in part, with magnetic separation. Applicants did not elect to prosecute this species (A 141, fourth paragraph; A 159, final paragraph), but instead elected the species in which settling is the preliminary separation step. In accordance with present Rule 141 of the Rules of Practice of the United States Patent Office in Patent Cases, which corresponds, in general, with old Rule 41 of the Rules of Practice in the United States Patent Office, only a single species may be claimed in an application for patent, if the application does not contain an allowable generic claim. Because of such a provision in the Patent Office rules, claim 35 need not be considered by this Court, unless the Court finds one or more of the broader claims to be patentable.

SUMMARY OF ARGUMENT

1. Invention was not required to apply froth flotation to the clarification of lubricating coolants. Such application was an obvious extension of the teachings of Booth patent, No. 2,153,449, as to the clarification of rayon spin baths. All the claims in controversy are unpatentable over that patent, either alone or taken with the patent to Brown, No. 1,455,187.

2. Claims 39 and 40 on appeal are additionally unpatentable on the ground of double-patenting.

3. The commercial success of the process defined by the claims in controversy is not determinative of patentability, and appellant has not established that the industry's need for that process would have remained unsatisfied if industry had known of the teachings of the Booth patent, No. 2,153,449.

4. The District Court did not mistake the significance of the decision of the Supreme Court in *The Great Atlantic and Pacific Tea Co.* v. *Supermarket Equipment Corporation,* 340 U. S. 147.

ARGUMENT

1. The Claims in Controversy Are Unpatentable Over the Prior Art.

In refusing to be blinded (A 150, final paragraph) by the insignificant details recited in some of the claims of the application of Robert Ben Booth and Norman Morash, the Board of Appeals sharpened the issues before it, and likewise before the District Court. The issues at the trial were further sharpened by appellants' selection, as stated, of claims 33 and 40 as representative of all the claims in controversy. The main issue here, as before the District Court, really is whether invention was required to apply froth flotation, broadly, to the clarification of lubricating coolants. That broad issue can substantially be determined by consideration alone of the patent (Ex. Bk. 1-A) to applicant Booth, No. 2,153,449, granted April 4, 1939, and the patent (Ex. Bk. 1-D) to Brown, No. 1,455,187, granted May 15, 1923.

Brown's patent is entitled "Grinding Fluid Circulating System." In dealing with such grinding fluids as those formed as an emulsion of water and oil (Ex. Bk. 1-D, page 1, lines 14 to 21), and in directing his efforts toward "readily and economically separating from the grinding fluid substantially all of the solid particles which may affect the grinding action detrimentally" (ibid., page 1, lines 44 to 54), Brown "discovered that centrifugal action may be employed to separate the grit and other solid particles from the grinding compound and produce a substantially clear fluid" (ibid., page 1, lines 75 to 81). Brown combined with the centrifuge in the fluid circulating system a settling tank, which, he asserted (ibid., page 1, lines 81 to 88), would "serve to remove the coarser particles and permit the centrifugal device to act only upon the fine suspended matter."

Booth's patent is entitled "Clarification of Rayon Spin Baths." As stated, Booth received that patent on April 4, 1939, and hence more than the statutory year prior to the filing by him and Morash, on May 20, 1942, of their application on appeal, entitled "Method for Clarifying Lubricating and Cooling Emulsions." In that early patent, Booth noted (Ex. Bk. 1-A, page 1, first column, lines 13 to 21) that such a bath becomes befouled with "decomposition products including sulfur and requires clarification before the bath can be reused." To clarify those fouled rayon spin baths, Booth resorted to "froth flotation such as is used in the ore dressing art" (ibid., page 1, first column, lines 50 to 53), with or without the addition of flotation agents (Cf. ibid., page 1, second column, lines 3 to 8, and lines

13 to 21), carrying such flotation process on in different types of flotation machines, including the Fagergren machine (ibid., page 1, second column, line 44 to page 2, first column, line 10). "The question," Booth stated (ibid., page 1, second column, lines 22 to 26), "of whether a reagent should be used is largely one of economics." As an allegedly "unique" characteristic of his patented process, and in purported contrast to ordinary flotation processes, Booth related (ibid., page 1, second column, lines 30 to 43) that "the same flotation procedure removes a concentrate which contains sulfur to the extent of 70-80% with the remaining material which is chemically totally unrelated to sulfur." This allegedly significant feature is emphasized in the claims (ibid., page 2, second column), which recite that the froth removed in the defined method "contains the bulk of the turbid impurities." "Turbid impurities," of course, would include all stirred up sediment, inclusive of or additional to sulfur, that might have caused the rayon spin bath to become clouded, muddy, or polluted.

The patents to Brown and Booth plainly meet representative claims 33 and 40 on appeal, and, with them, all the other claims in controversy. In the face of the specific finding of the District Court (A 18, Finding of Fact No. 17) that "Froth flotation, as applied to the clarification of contaminated lubricating coolants, involves no unusual phenomena, and gives generally forseeable results," appellant argues (Brief for Appellant, pages 10 to 16) that the process claimed by Booth and Morash involves "unique" phenomena, and "yields new results entirely unforseeable from prior froth flotation knowledge." The froth flotation knowledge to which appellant refers would appear to be knowledge in the mineral dressing field (See A 72, answer to first question; A 46, answer to Court's question; A 104, final question and answer). Pioneer work by Booth, if not by others, in the application of froth flotation outside the field of mineral dressing preceded, however, the joint activity by Booth and Morash. Of course, it is against this extension of froth flotation procedure that the activity of Booth and Morash is to be evaluated.

Whether or not selective separation characterizes the practice of froth flotation in the field of mineral dressing, the fact is that Booth had taught that "the bulk of the turbid impurities" could be removed from a rayon spin bath by froth flotation. In clarifying that bath, froth flotation removed more than sulfur, and hence more than a single component. To repeat, Booth (Ex. Bk. 1-A, page 1, second column, lines 30 to 35) characterizes his patented process as "unique" in that "the same flotation procedure removes a concentrate which contains sulfur to the extent of 70-80% with the remaining material which is chemically totally unrelated to sulfur." Concerning this phenomenon, Booth, in his patent (ibid., page 1, second column, lines 35 to 43), adds: "Such a result is in marked contrast to the ordinary flotation processes which are highly selective and which depend for their action on the separation of materials of different types of chemical composition. The reason for the anomalous behavior of the present process is not as yet determined, and the invention is not limited to any set theory of operation." Prior to his joint activity with Morash, Booth had dispensed with flotation agents, and had relied upon aeration and agitation alone in practicing froth flotation. In his patent, Booth specifically states (ibid., page 1, second column, lines 3 to 10):

> "The flotation process is in some respect unique in that it is apparently not dependent on the use of any particular definite flotation agent. It is possible to float with air alone without any reagents or with the addition of frothers or collectors. This is most unusual as the ordinary flotation processes are rather rigidly limited to the use of particular classes of collecting agents."

From the foregoing, it will appear that, so far as froth flotation is concerned, the process claimed by Booth and Morash, involving the clarification of lubricating coolants, represents merely an extension of the experience gained by Booth, himself, in the clarification of other liquids, those in rayon spin baths. Froth flotation may indifferently be called a process, a procedure, a "manipulative technique" (Cf. Brief for Appellant, page 40, paragraph "B"; page 43, final paragraph), or a "processing technique" (ibid, Statement of Questions Presented). The point is that Booth and Morash merely made an obvious use of what was old and well known, and hence earned no right to be termed inventors. *Lovell Manufacturing Co.* v. *Cary,* 147 U. S. 623.

In the *Lovell* case, the Supreme Court concluded (page 639) that the "same principle" set forth in the patent to Cary in suit was developed in the manufacture of wire bells for clocks and of hair-balance springs, and that there was "no patentable invention in applying that principle to the springs," for furniture, "mentioned in the specification." In response to Cary's contention that the bell-making process was for a different purpose than that contemplated by this patentee in his specification, and that the results were not analogous, the Supreme Court stated (page 632):

> "* * * we are of opinion that in the Cary process and the bell-making process the operations are precisely the same. In both, the operator is dealing with wire which is strained by being bent past the elastic limit, and is deadened thereby. The wire is blued by subjecting it to a degree of heat sufficient for the purpose, and is then allowed to cool. The result in both cases is the same, namely, the restoration, stiffening and equalizing of the wire, and the only difference is in the use to which the resulting article is put. In both, the wire is made stiffer and more spring-like, these qualities being utilized, in one case in a furniture spring, and in the other in a clock-bell. Cary observed that, in winding furniture springs, the wire, already weakened by the drawing process, was still further strained and deadened, so as to impair the quality of the spring. The question was, how to equalize and stiffen the mechanically strained steel wire. The same problem had been solved by the clock-bell makers, and the solution of the problem was merely the use of the knowledge possessed by those skilled in the art. The wire used in making the clock-bells was also hard-drawn wire; but it does not appear that the process of the patent acts differently, when applied to strained hard-drawn

> wire, from what it would if applied to strained wire that was not hard-drawn.
>
> "The difference contended for by the plaintiffs, between the process of blueing wire clock-bells and the process of blueing furniture springs, in that one deals with spiral articles and the other with articles of a helical form, is not a difference in the process, but is at most a difference in the articles to which the process is applied. If the straining of furniture springs is peculiarly aggravated because of their shape, the difference is merely one of degree, not of kind."

With respect to Cary's contention that no one had previously used the former processes for the manufacture of furniture springs, the Supreme Court said (page 636):

> "In the present case, it appears that it was not until a short time before 1870 that furniture springs began to be commonly made of steel wire. It was not until 1868, when the general introduction of Bessemer steel and open-hearth steel afforded a cheap substitute for iron, that the use of steel became general in the art in question. It was then natural that there should be introduced into that art methods of treatment which were well known as applied in allied arts. The method of the patent, already in use, thus occurred to Cary; but he was appropriating a method which was common property. When steel was adopted for the first time in any art, it was natural that existing methods of treating it should be applied to its new

> use in the given art. The case is merely one of a double use. Nor is it of force that experts expressed surprise that the process in question was applicable to furniture springs.
>
> "Cary was not the first to discover the process described in his specification, for the restoration of steel. He claims only the process; and the use made of the article after it is subjected to the process does not affect the nature of the process itself. As a process, there is nothing new in the subject-matter of the claim."

The Supreme Court reviewed its prior decisions and deduced the rule (page 637) that "it is not a patentable invention to apply old and well-known devices and processes to new uses, in other and analogous arts." This Court also reiterated its ruling in *Ansonia Brass and Copper Co.* v. *Electrical Supply Co.*, 144 U. S. 11, that "the application of an old process or machine to a similar or analogous subject, with no change in the manner of application, and no result substantially distinct in its nature, will not sustain a patent, even if the new form of result had not before been contemplated."

Claim 33 and similar claims would be unpatentable in view of the Booth patent, No. 2,153,449, even were its teachings not so specific as they are. As indicated in that patent, froth flotation is an old technique for separating materials. In resorting to that technique, the applicant and witness, Booth, conceded (A 99), he and Morash "expected something to float" after they "had run the settling test and had observed that a certain portion did float." That the results allegedly obtained might have exceeded the expectations of Booth and Morash would not serve to turn what was a non-inventive concept into an inventive one. *In re Gauerke,* 24 C. C. P. A. 725, 86 F. 2d 330; *In re Grettie,* 26 C. C. P. A. 1259, 104 F. 2d 359; *In re Valko et al,* 36 C. C. P. A. 899, 173 F. 2d 275; *Lovell Manufacturing Company* v. *Cary,* supra. In the Lovell case, the Supreme Court further said:

> "* * * it does not amount to invention to discover that an old process is better in its results, when applied to a new working, than would have been expected, the difference between its prior working and the new working being only one of degree and not one of kind. It has been often held that the mere fact that one who uses a patented process finds it applicable to more extended use than has been perceived by the patentee, is not a defence to a charge of infringement. It follows necessarily that the public cannot be deprived of an old process because some one has discovered that it is capable of producing a better result, or has a wider range of use than was before known."

As fully pointed out in the discussion hereinabove of the Brown patent, No. 1,455,187, the settling step, recited in claim 40, is therein disclosed in combination with the centrifuging of the lubricating coolant, and as a prior conditioning procedure. To substitute a froth flotation cell for the centrifuge of the Brown patented system, or speaking in terms of process, to substitute froth flotation for centrifuging, would not involve the exercise of invention. Appellant insists (Brief, page 9, second paragraph; page 27, fourth and fifth paragraphs) that the process defined in claim 40 is "continuous." Since the process disclosed in the Brown patent plainly is a "continuous," as opposed to a "batch," process, what appellant's contention amounts to is that the process defined by claim 40 is more "continuous" than the process shown by Brown (Cf. A 34, 35, 53, 54, and 97). A system including a settling tank and a flotation cell may be continued in operation, without attention, for a longer period than a similar system using a filter (Cf. A. 60 to 62) or a centrifuge, because, unlike those devices, the flotation cell is self-cleaning (A 101). In other words, the continued operation which is possible with the use of a flotation cell is a mere concomitant of that use.

The other patents cited by appellee in his answer (A 11) are not so markedly significant as the patents to Brown and Booth. These patents, including the patents to Callow and Breerwood, which were not before the Board of Appeals, do, however, have the virtue of "cumulatively demonstrating the use of the flotation idea outside of the ore treating field and as showing the flotation assisting properties of the components of applicants' lubricating-coolant emulsion" (A 159, first paragraph).

The Karlstrom patents, Nos. 1,717,223 and 2,248,177 (Ex. Bk. 1-F and 1-G), show the extension of flotation, broadly, rather than froth flotation, specifically, beyond the field of mineral dressing. They teach that if air or another gas is introduced into a tank containing the so-called "white" or waste water coming from paper mills, the paper-pulp fibers will be lifted to the surface by adhering bubbles and can thereby be recovered. Breerwood, in his patent, No. 2,214,717 (Ex. Bk. 1-C), teaches that froth flotation specifically may be employed as a step in the beneficiation of cement raw materials.

The patent to Sulman et al., No. 835,120 (Ex. Bk. 1-I), the patent to Munro, No. 1,937,837 (ibid., 1-H), and the patent to Callow, No. 1,366,767 (ibid., 1-E), afford a general picture of froth flotation as particularly applied in the field of ore concentration.

The Sulman et al. patent teaches that metalliferous matter, graphite and the like, may be separated from gangue by means of oils and fatty acids, including, specifically, oleic acid (Ex. Bk. 1-I, page 1, lines 9 to 15 and lines 79 to 82). As broadly expressed, for example, in claim 1 (ibid., page 3), this process consists in mixing the powdered ore with water, adding a small proportion of the oily liquid "amounting to a fraction of one percent on the ore," agitating the mixture until the oil-coated mineral matter forms into a froth, and separating the froth from the remainder by flotation. The patentees state (ibid., page 1, lines 89 to 101) that the froth derives "its power of flotation mainly from the inclusion of air-bubbles introduced into the mass by the agitation."

The patent to Munro provides for the concentration of ores by a combined classifying and flotation operation. Classifying means of the reciprocating rake type collect and discharge larger particles of ground ore that settle from the liquid in which they are suspended. Finer particles are removed by flotation (Ex. Bk. 1-H, page 1, lines 26 to 60). The flotation means exemplarily is of the aeration type, and comprises a "manifold 12 connected to a supply pipe 13 for compressed air, and having a plurality of vertical pipes 14 connected thereto and extending downwardly therefrom, and provided at their lower ends with nozzles 14′ for distributing air into the body of pulp" (ibid., page 1, lines 61 to 87). Munro expressly asserts that "oils, cresols or other substances having the required flotative properties, are added to the pulp before or after it enters the flotation part of the apparatus" (ibid., page 2, lines 66 to 75).

The patent to Callow teaches that oils may be mixed with finely ground ore pulp and the mixture "then subjected to a violent agitation with the result that large volumes of air are beaten into and entrained by the pulp for the purpose of producing a froth composed of bubbles of air and oil to which the mineral particles attach" (Ex. Bk. 1-E, page 1, lines 32 to 52). Such agitation of the pulp and the oily constituents thereof is induced by fine streams or jets of air, gas or vapor, to produce a froth composed of bubbles of air "having an envelop or covering of oily matter to which the mineral particles in the pulp have an affinity and will attach" (ibid., page 3, lines 4 to 29).

2. Claims 39 and 40 in Issue Are Additionally Unpatentable on the Ground of Double-Patenting.

A comparison, element by element, of claim 7 of the Booth and Morash patent, No. 2,436,375 (Ex. Bk. 1-B), on the one hand, with claims 39 and 40 of the Booth and Morash application, Serial No. 443,816, on the other hand, should serve, without more, to show that, though differing in phraseology, they cover the same substantial subject matter. Appellant at the trial emphasized solely (A 78 to 81) that claim 7 of the patent, unlike claims 39 and 40 of the application, includes, as a final step, removing settled particles from the non-turbulent or settling zone without substantially altering the fluid flow conditions therein. In the cited testimony, performance of the specified step was ascribed to the endless chains 48 carrying rakes 47 which move in the settling tank or chamber 41 (Ex. Bk. 1-B, column 7, lines 27 to 39). But according to further broad language of the specification of the patent, as appellant now admits (Brief, page 35, first paragraph), the "settled particles may be removed * * * by hand" (ibid., column 9, lines 5 to 8; Cf. A 101 and 102). With the obvious step of hand removal of settled particles thus coming within the scope of the final limitation of claim 7, it follows that this limitation is of no patentable consequence, and hence does not serve patentably to differentiate claim 7 of the patent from claims 39 and 40 of the application. A claim of an application must, of course, be refused on the ground of double patenting when it is in substance the same as a claim of a patent issued to the same party. *In re Forrest,* 18 C. C. P. A. 1028, 47 F. 2d 395; *In re Peiler,* 20 C. C. P. A. 718, 62 F. 2d 98.

3. Commercial Success.

Appellant stresses commercial success (Brief, pages 24 to 27). The District Court recognized (A 19, Finding of Fact No. 24) that the process claimed by Booth and Morash had gone into extensive commercial use, but nevertheless found it unpatentable. As that Court indicated (A 19, Conclusion of Law No. 1), commercial success is relevant only in a close case where all other proof leaves the question of invention in doubt. See *Dow Chemical Co.* v. *Halliburton Oil Well Cementing Co.,* 324 U. S. 320.

Appellant suggests (Brief, pages 21 to 27) that the Booth and Morash process satisfied a long existing need. If that want had continued despite knowledge in the art of the Booth patent, No. 2,153,449, relating to clarification of rayon spin baths, the industrial acceptance of the Booth and Morash process could be a factor in determining whether invention was required to devise the process, but it could not otherwise be a factor. *Landis Machine Co. et al.* v. *Parker-Kalon Corp. et al.,* 190 F. 2d 243, 90 USPQ 129; *Frank B. Killian and Company* v. *Allied Latex Corporation,* 188 F. 2d 940, 89 USPQ 219; *Condenser Corporation of America* v. *Micamold Radio Corp.,* 145 F. 2d 878. As Judge Learned Hand stated in the *Killian* case:

> "* * * the inventor must justify his contribution against all that has gone before, known and unknown. Yet when he seeks to use the art's failure to anticipate him as evidence of his own perspicacity, he must appraise the art's ineptitude by the art's actual knowledge; he may not impute to it an acquaintance with any part of what went before of which it was not aware."

Here, appellant's whole effort is to measure the alleged advance made by Booth and Morash against the knowledge of froth flotation in the mineral dressing field.

4. The A. and P. Decision.

The trial court, in its memorandum opinion (A 13), merely indicated that language quoted from the decision of the Supreme Court in *The Great Atlantic and Pacific Tea Co.* v. *Supermarket Equipment Corporation et al.,* 340 U. S. 147, was "appropriate" in the case at bar, and bore upon the finding made as to lack of invention. Other courts at subsequent dates attached similar significance to that decision. *Lenox* v. *Landers,* 89 USPQ 238, 188 F. 2d 744; *Martin* v. *Wyeth, Inc.,* 89 USPQ 238, 96 F. Supp. 689; *Packwood* v. *Briggs and Stratton Corporation et al.,* 90 USPQ 335.

CONCLUSION

For the reasons given in the decisions of the Board of Appeals, in the decision of the District Court, and in the foregoing brief, the appellant, it is submitted, is not entitled to a patent on the application of Robert Ben Booth and Norman Morash containing any of claims 33 to 43 of that application.

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